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2024

COMMUNICATION AND CULTURE

MULTIDISCIPLINARY PERSPECTIVES



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Seven Editora.

Communication and Culture [electronic resource] :
Multidisciplinary Perspectives / Seven Editora. – São José dos
Pinhais, PR: Seven Editora, 2024.

Electronic data (1 PDF).

Includes bibliography.

ISBN 978-65-6109-038-4

1. Communication - cultural aspects. 2. Multidisciplinarity. I
Title.

CDU 659.3

Indexes for systematic catalogue:

1. CDU: Media 659.3

Cataloguing at source: Bruna Heller (CRB10/2348)

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Adriane Stefany Batista dos Santos
Ana Ariela Gusmão Versiani
Ana Karen Vasconcelos Araújo
Anderlyvia Nunes Franklin
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Francisco Eudes Almeida da Costa
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Liliane Silva do Nascimento
Luan Xavier Santos
Lucicleide da Silva
Luiz Henrique Lopes Rodrigues

Lurdete Maria Rocha Gauch
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Fernanda Paiva Fiedler, Bárbara Lídia da Silva Pereira, Simone Soares Pedrosa, Lurdete Maria Rocha Gauch, Davi Lavareda Corrêa, Liliane Silva do Nascimento, João Pedro Costa Pedrosa, Hercules Bezerra Dias, Isabelle Rocha Gauch, Vania Castro Corrêa, Suelen Castro Lavareda Corrêa and Sue Ann Lavareda Corrêa Uchôa

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 <https://doi.org/10.56238/sevened2024.014-018>

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  <https://doi.org/10.56238/sevened2024.014-028>

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Oral rehabilitation in victims of domestic violence and its relationship with self-esteem and quality of life

 <https://doi.org/10.56238/sevned2024.014-001>

Fernanda Paiva Fiedler¹, Bárbara Lídia da Silva Pereira², Simone Soares Pedrosa³, Lurdete Maria Rocha Gauch⁴, Davi Lavareda Corrêa⁵, Liliâne Silva do Nascimento⁶, João Pedro Costa Pedrosa⁷, Hercules Bezerra Dias⁸, Isabelle Rocha Gauch⁹, Vania Castro Corrêa¹⁰, Suelen Castro Lavareda Corrêa¹¹ and Sue Ann Lavareda Corrêa Uchôa¹²

ABSTRACT

Domestic violence is a complex problem that affects people of all ages, races, creeds and social classes, generating several complications for women. Many of the traumas resulting from violence are orofacial, causing physical and functional changes, as well as aesthetic impacts that can aggravate chronic problems, such as depression. This significantly affects the quality of life and social interaction of victims, as psychological complications negatively influence the perception of oral health. This study aims to report the humanized oral rehabilitation of a patient who is a victim of domestic violence, correlate rehabilitation treatment with self-esteem and quality of life, and encourage the interruption of domestic violence. The treatment was carried out at the Integrated Clinic III and IV of the School of Dentistry of the Federal University of Pará (UFPA), following a plan that involved several areas of Dentistry and with the patient's consent. The patient received guidance on oral hygiene and underwent procedures such as scaling, prophylaxis, extractions, endodontic treatments, composite resin restorations, intraradicular retainers, total acrylic resin crowns, and temporary upper partial dentures (PRP). It was concluded that oral rehabilitation significantly increased the patient's self-esteem and quality of life, encouraging her to complete the treatment with crowns and definitive PRPs, in addition to contributing to the interruption of cycles of domestic violence.

Keywords: Oral Rehabilitation, Domestic Violence, Self-Image, Oral Hygiene.

¹ Origin: UFPA

E-mail: fiedlerfernanda1@hotmail.com

² Origin: UFPA

E-mail: barbarapereira.cdentista@gmail.com

³ Origin: Prof^ª. Associate III of FO-UFPA

E-mail: sspedrosa@ufpa.br

⁴ Origin: Prof^ª. Associate III of FO-UFPA

E-mail: lrgauch@ufpa.br

⁵ Origin: Prof^ª. Adjunct of FO-UFPA

E-mail: davalavareda2@yahoo.com.br

⁶ Origin: Associate IV UFPA Full Professor at FO-UFPA

E-mail: dralilianesn@hotmail.com

⁷ Origin: Undergraduate student of Dentistry at UFMA

E-mail: joao.pedrosa@discente.ufma.br

⁸ Origin: Adjunct Professor of FO-UFPA

E-mail: herculesdias@ufpa.br

⁹ General Surgery Resident

E-mail: isabellegauch.uepa@gmail.com

¹⁰ Origin: Prof^ª. Associate III of FO-UFPA

E-mail: vania@ufpa.br

¹¹ Origin: Brazilian Air Force

E-mail: suelenlavaredam@gmail.com

¹² Origin: São Leopoldo Mandic Research Center

E-mail: sueann.lavareda@yahoo.com.br



INTRODUCTION

According to the WHO (World Health Organization), violence against women is considered a public health problem, as the victims have several physical and psychological disorders, which can directly interfere with their health¹. According to the Ministry of Women, Family and Human Rights, in 2021, 198,644 complaints of violence against women were registered on the platforms offered by the government². Until May 2022, about 59.51% of the complaints on the platforms had women as victims, and the North region of the country has a large number of complaints. The silence of victims is a dominant factor in the perpetuation of violence². A survey by the WHO, in partnership with the London School of Hygiene and Tropical Medicine and the Medical Research Council, carried out in 80 countries, revealed that 30% of women reported having suffered some form of physical and/or sexual violence by their partner¹.

According to Law 11.340, of August 7, 2006, known as the "Maria da Penha Law", domestic and family violence includes any action or omission based on gender that causes death, injury, physical, sexual or psychological suffering, as well as moral and property damage³. It is known that many injuries resulting from violence have a great aesthetic impact, which can intensify chronic problems such as depression, significantly interfering with quality of life and social interaction, according to Article 7, item II³. This article defines psychological violence as any conduct that causes emotional damage, diminishes self-esteem, or that harms and disturbs the full development of the victim³.

This type of violence brings several losses, including high economic costs for the country, whether through medical expenses, impediment to productive work or effects on mental health, becoming a priority in human rights⁴. Although the term "domestic violence" includes people who live in the family environment without necessarily having blood ties, in 70% of cases, the perpetrator is the victim's intimate partner⁷. Thus, domestic violence is understood as a power relationship between a man and a woman, where the masculine determines the role of the feminine, evidencing gender inequality⁶.

There is also a naturalization on the part of some women, who do not recognize violent actions as a violation of their human rights, freedom, right of expression and physical and mental well-being⁷. Aggression causes suffering that goes beyond physical marks, leaving intangible marks⁸. This issue is so critical that, according to the United Nations (UN), 40% of Brazilian women have suffered domestic violence at some point in their lives⁹. Brazil ranks 5th in the ranking of femicide among 83 countries, with a woman being killed every 2 hours in the national territory⁹. Despite fear and constant intimidation, some women are able to abandon their aggressive partner, especially when the aggression intensifies.



About 42% of women who suffered violence reported that physical injuries are the main consequence, often involving the face, such as the lips, the area around the eyes, and teeth¹. Thus, the dentist plays a crucial role in identifying and reporting violence to the competent bodies, in addition to offering treatment, as health professionals are usually the first to contact the victim¹¹. Emotional damage directly affects the victims' self-esteem, with devastating repercussions on their quality of life¹². In dentistry, the dental surgeon can work in a multidisciplinary team, restoring not only aesthetics, but also function and well-being through oral rehabilitation¹³.

Despite this, there are few cases in the literature that demonstrate the role of dentists in the rehabilitation of victimized patients, indicating a still limited role of dentistry in the reintegration of these women into society¹⁴. Thus, the objective of this study is to describe the rehabilitative dental treatment, with humanized care, adopted for a patient who is a victim of domestic violence, to correlate the results obtained with her self-esteem and quality of life using the Phrase Completion Scale¹⁷, in addition to encouraging the interruption of domestic violence.

CASE REPORT

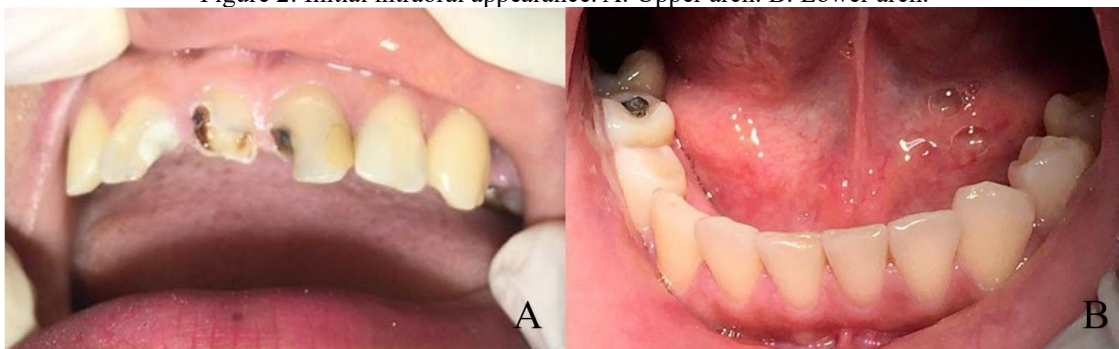
Patient L.L.S., a 31-year-old female pheoderma, sought the Faculty of Dentistry of the Federal University of Pará (UFPA), complaining of dissatisfaction with the aesthetics of the anterior teeth, motivated by an "affective misunderstanding" and pain in some elements, which would be repressing her smile and directly interfering with her self-esteem, thus preventing her social life. He had been a smoker for about 10 years and had no history of systemic diseases. Extraoral examination revealed that the vertical occlusion dimension (OLD) was reduced, but the lip support, grooves and commissures were satisfactory (Figure 1A-B).

Figure 1: Initial extraoral appearance. A: Frontal. B: Right Side



Intraoral clinical examination revealed fractures and caries in teeth 12, 11 and 21; cavities in teeth 23, 17, 38 and 46; extensive restoration in 22 reaching the pulp chamber; residual roots of teeth 14, 26 and 28 and absence of teeth 15, 16, 17, 24, 25, 36 and 48 (Figure 2A-B).

Figure 2: Initial intraoral appearance. A: Upper arch. B: Lower arch.



Periapical and panoramic radiographs showed pulp necrosis of teeth 12, 11, 21, 17 and 46, which was confirmed by negative sensitivity tests (Figure 3).

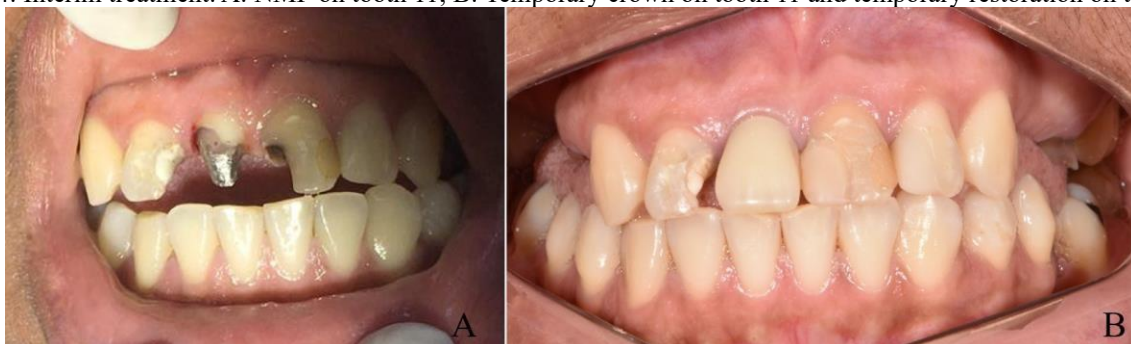
Figure 3: Initial panoramic radiography.



Before the beginning and at the end of the treatment, a questionnaire was applied to the patient, based on the Phrase Completion Scale, which is a standard scale of 11 points (from 0 to 10), which facilitates interpretation, because people are more familiar with this reference, so the objective of the questionnaire was to relate dental treatment with self-esteem and quality of life at the beginning and end of treatment.

The treatment plan was discussed with the specialties of periodontics, surgery, endodontics, dentistry and prosthodontics. The treatment began with periodontal probing, scaling, straightening and corono-root polishing. Then, the cleaning and temporary sealing of the open cavities of teeth 17, 38 and 46 was initiated to reduce contamination in subsequent surgeries to extract the residual roots of teeth 14, 26 and 28. Initially, the endodontic treatment of tooth 11 was performed, due to a painful complaint by the patient, and after the treatment, a fused metal core (MFN) and a temporary crown were made (Figure 4A), in addition to the temporary restoration of tooth 21 (Figure 4B), due to social necessity; Subsequently, endodontic treatments were performed on teeth 12, 21, 22, 17 and 46.

Figure 4: Interim treatment. A: NMF on tooth 11; B: Temporary crown on tooth 11 and temporary restoration on tooth 21.



Study models of the two arches (Figure 5A-B) were made and mounted on the semi-adjustable articulator (ASA) through a facial arch register for the upper model and an interocclusal

register in a centric relationship with Lucia's Jig and a wax slide No. 9 for the lower model (Figure 6).

Figure 5: Study models. A: Upper arch. B: Lower arch

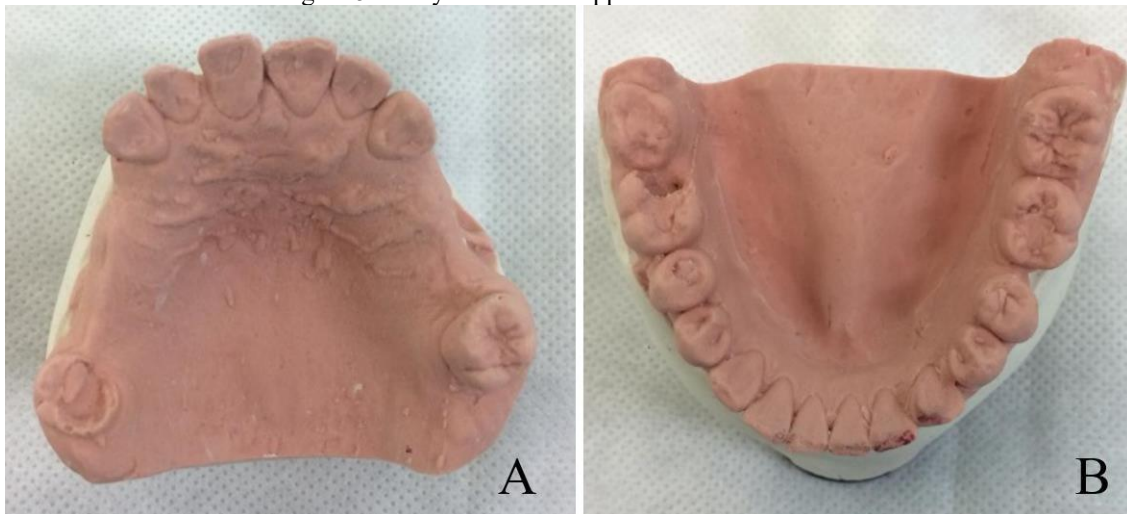


Figure 6: Models mounted on the ASA.



The ASA was sent to the laboratory for wear of the extruded teeth (35 and 46), diagnostic wax-up (teeth 17, 12, 11, 21, 22, 27, 38, 37, 33, 32, 31, 41, 42, 43, 44, 46 and 47) and assembly of artificial teeth in the areas of dental absences (14, 15, 16, 24, 25 and 26) for correction of the occlusion plane and preparation of upper provisional PRP (Figures 7: A, B and C).

Figure 7: Models delivered from laboratory A: Diagnostic wax-up of the lower elements. B: Upper PPR test base and teeth. C: Waxing of the crowns of the maxillary incisors.



Individual trays (acetate) were made for home whitening in a vacuum laminator and the patient used 22% carbamide peroxide gel (Whiteness Perfect, FGM), 1 hour a day for 14 days to whiten her teeth, as well as an office session was also performed, about 1 month and a half later, in order to whiten only the upper canines. using 37.5% hydrogen peroxide gel (Pola Office Plus, SDI).

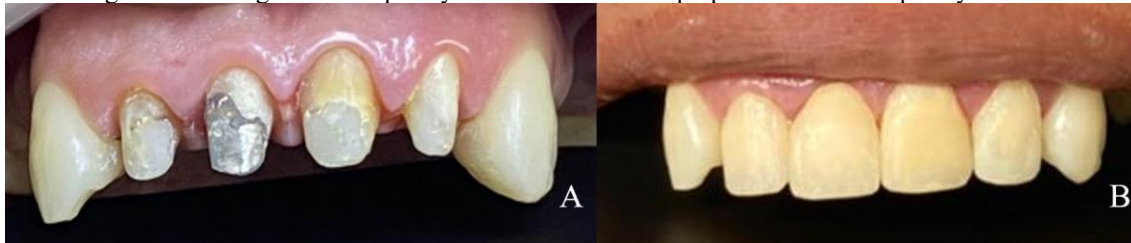
In the first consultations, it was observed that the patient had a very withdrawn profile, extremely silent and easily moved. During each procedure, we can analyze more clearly the patient's behaviors and short excerpts from the patient's reports about her oral condition. During the treatment, she confirmed to us the violence she had suffered under great emotion and anguish, which had made her negligent with her oral health.

The conduits of teeth 12, 21 and 22 were de-obtured under absolute isolation, using glove-gate drills in sequence 2 and 3, leaving 5 mm of obturator material in each conduit; The fiberglass pin test and periapical X-ray were performed to prove the adaptation (21 and 22, n° 0.5 and 12, n° 1; White post DC, FGM); the teeth were conditioned with 37% phosphoric acid (Condaaf, AAF do Brasil) for 15 seconds in the conduit and 30 seconds in the tooth remnant, washed for 1 minute, dried with air jets and an absorbent paper cone inside the conduits, and then the adhesive (Ambar-FGM®) was applied to the teeth and polymerized for 30 seconds after the removal of the excesses. The pins were cleaned with 70% alcohol, silanized (PROSIL, FGM) and cemented with dual resin cement (Allcem® TR, FGM); The cement was applied to the conduits and pins and polymerized for 40 seconds. After 10 minutes, the pins were cut and the teeth were provisionally restored with composite resin (Z250, color A2, 3M/ESPE).

Thus, with the purpose of occlusion stabilization, composite resin reanatomizations (Z250, A2, 3M/ESPE) were performed on teeth 13, 27, 23, 38, 37, 35, 34, 33, 32, 31, and 41 (buccal, incisal/occlusal and lingual/palatal surfaces), using the wall technique made with condensation silicone (Reflex Denso, Yllor) on the waxed diagnostic model. Teeth 46 and 17 received direct restoration in fluid composite resin for the base (Master flow, Biodynamics) and then were reanatomized in composite resin (Z250, A2, 3M/ESPE) following the predetermined occlusion plane.

Teeth 12, 11, 21 and 22 were prepared for full crown (drill 3216, 3118, 3216 F and 3118 F) and provisional crowns made using the veneer technique (Biolux teeth, color 60, V 68) in different sessions (Figure 8, A and B).

Figure 8: Making of the temporary crowns. A: Beveled preparations. B: Temporary crowns.



New models were made, mounted on the ASA (facial arch and registration at the usual maximum intercuspation with a No. 9 wax blade) and sent to the prosthesis laboratory to obtain new temporary crowns that would provide greater mechanical resistance and better aesthetic results, in addition to the upper provisional PRP (Biolux teeth, color 60, P6) to complete the occlusion stabilization. The upper arch was molded with two-stroke condensation silicone (Perfil, Coltene) after gingival clearance of teeth 12, 11, 21 and 22 with retractor wire (Ultrapak n° 000, Ultradent) and hemostatic solution (Hemoliq, Maquira) and the lower arch with alginate (Jeltrate Dustless, Dentsply). The temporary crowns were internally sandblasted with 50 micrometer aluminum oxide and silanized (Prosil, FGM); the teeth were conditioned with 37% phosphoric acid, the adhesive (Ambar APS, FGM) was applied and polymerized, and the crowns were cemented with dual resin cement (Ambar TR, FGM). The provisional upper PRP was adjusted and installed (Figure 9: A, B, C, and D).

Figure 9: Final result. A: Smile. B: Upper occlusal. C: Inferior occlusal. D: Temporary crowns



DISCUSSION

Domestic violence is a complex problem that affects people of different ages, races, creeds and social classes, generating a series of complications for women, both physical and psychological¹⁻¹⁶. Most injuries caused by violence occur on the face, resulting in orofacial traumas that have a significant aesthetic impact on women's lives, and can trigger chronic diseases such as depression^{10,11}. These complications significantly interfere with the quality of life and social interaction of the victims, reducing their self-esteem and affecting the perception of their oral health, as reported by the patient in this study^{11,12}.

The fragility of victims leads to a greater demand for health professionals, whether for psychological, physical or rehabilitative treatments^{4,13}. Women who seek primary health care often show signs of violence, such as anxiety, shame, introverted behavior, or bodily injuries^{4,17}, and may be more sensitive during procedures in the affected area, which may refer them to the aggressions suffered, as observed in the patient in this study.

In recent years, awareness of domestic violence has grown significantly, showing the impacts of this violence on interpersonal relationships and quality of life of victimized women^{1,2}. These women often become invisible in society, either by hiding events from the authorities or by seclusion due to social embarrassment and low self-esteem^{4,6,12}. Therefore, it is crucial to include this theme in the curricula of undergraduate courses, helping dentists to develop a critical awareness that facilitates the identification of violence as members of society^{13,17}.



The training of dentists is essential for them to act as mediating and reliable agents, facilitating the reporting of cases and allowing adequate treatment and proper guidance to deal with violence^{5,11}. Most of the articles that relate violence to self-esteem and were used in this study are from the years 2018 to 2020^{10-12,14,17,19,21}, evidencing the need to discuss this topic, which has gained visibility. However, there are still few studies of case reports that demonstrate the clinical protocols adopted in dental fractures and the post-rehabilitation results, clarifying the victim's conditioning in the dental office and their expectations in the face of the new social reality^{7,10}.

The chosen treatment was based on the patient's socioeconomic condition, prioritizing function and, consequently, aesthetics, raising her self-esteem as assessed by the questionnaire based on the Phrase Completion Scale¹⁷. An improvement in the patient's social behavior was observed throughout the treatment, becoming less introverted and more sociable^{4,10,12}, rediscovering her value and raising her self-esteem and quality of life, as shown in the questionnaire.

Rehabilitative treatment with anterior total crowns is indicated in cases of extensive fractures that impair aesthetics¹⁸. The main limitation found was the financial issue, which prevented the advancement beyond the temporary prostheses, but did not compromise the quality of the treatment.

The face of violence goes beyond what dentistry can change^{11,16}. Therefore, it is essential to observe the clinical signs in addition to other factors that may indicate cases of violence, emphasizing the importance of humanized and comprehensive treatment and the construction of a relationship of trust between professional and patient, since the dentist is often the first to contact the victim.

CONCLUSION

This study concluded the importance of humanized dental care in the oral rehabilitation of women victims of violence. In many cases, the dentist is one of the first professionals to come into contact with the patient, and it is essential to identify transgressions, provide guidance on oral hygiene, and oral rehabilitation. Dentistry needs a greater stimulus to address this problem, evidenced by the absence of case reports with humanized care, which hinders decision-making during clinical treatment. In summary, dentists can be fundamental in the reintegration of these women into society, making them visible, restoring their self-esteem, improving their quality of life and encouraging the interruption of the cycle of violence.



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INFORMED CONSENT FORM

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Eu Lidia Lopes,
RG n° 6040119, residente à
Rodovia do Tapará, Res. Calçana Rua 2 N° 223A no
bairro Topomã cidade Belém, Estado PA, declaro por meio
deste Termo de Consentimento Livre e Esclarecido ter sido informado(a) sobre os
propósitos do trabalho intitulado “**Reabilitação oral em vítima de violência doméstica
e sua relação com autoestima e qualidade de vida**”, acerca dos procedimentos
realizados, seu objetivo e riscos e esclarecimentos permanentes e autorizo o uso as
imagens e vídeos obtidos durante o meu tratamento odontológico, sejam elas digitalizadas
ou impressas. Consinto que estas imagens sejam utilizadas para fins didáticos e
científicos, divulgadas em aulas, palestras e outros eventos científicos, assim como seu
uso em revistas, livros ou artigos, podendo mostrar ou não meu rosto, o que pode fazer
com que eu seja identificado(a), desde de que respeitada as normativas do Conselho
Federal de Odontologia.

Concordo voluntariamente em participar deste estudo e poderei retirar meu
consentimento a qualquer momento, antes ou durante, sem penalidade, prejuízo ou perda
de qualquer benefício que eu possa ter adquirido.


A utilização desse material não gera nenhum compromisso de ressarcimento, a qualquer
preceito, por parte do aluno(a).

Belém, 14/06/22.

Lidia Lopes

Assinatura do paciente

Oral rehabilitation in a patient with odontophobia – Case report

 <https://doi.org/10.56238/sevened2024.014-002>

Carla do Socorro Jatahy Brazão¹, Lurdete Maria Rocha Gauch², Renata Antunes Esteves³, Isabelle Rocha Gauch⁴, Tasso César da Costa Pereira⁵, Hercules Bezerra Dias⁶, Davi Lavareda Corrêa⁷, Vania Castro Corrêa⁸, Suelen Castro Lavareda Corrêa⁹, Sue Ann Lavareda Corrêa Uchôa¹⁰, João Pedro Costa Pedrosa¹¹ and Simone Soares Pedrosa¹²

ABSTRACT

Despite technological advances in dentistry, negative feelings still prevail in the area, such as odontophobia, which the World Health Organization classifies into three stages. Patients with this condition often postpone treatments, cooperate little, and resort to palliative medications, compromising their oral health. This study reports the case of a patient who faced oral complications due to odontophobia, highlighting the rehabilitation treatment plan adopted, its phases and results obtained. The diagnosis of anxiety was made using the Dental Anxiety Scale (DAS), created by Corah in 1969. It is concluded that understanding the patient's general conditions and motivation to seek dental treatment is crucial for a proper diagnosis and to establish an effective treatment plan. The installation of the prostheses resulted in a significant improvement in the patient's self-esteem, social well-being, reduced anxiety and improvements in diet.

Keywords: Dentistry, Anxiety, Treatment, Prosthodontics.

¹ Student at the Faculty of Dentistry of the Federal University of Pará (UFPA)

E-mail: Carlajatahyb@gmail.com

² Associate Professor III, School of Dentistry, Federal University of Pará (UFPA)

E-mail: lrgauch@ufpa.br

³ Associate Professor II, School of Dentistry, Federal University of Pará (UFPA)

E-mail: estevesra@gmail.com

⁴ Resident in General Surgery SUS-SP

E-mail: Isabellegauch.uepa@gmail.com

⁵ Dentistry student at the Federal University of Pará (UFPA).

E-mail: Tarso.cesarp@gmail.com

⁶ Adjunct Professor, School of Dentistry, Federal University of Pará (UFPA)

E-mail: herculesdias@ufpa.br

⁷ Adjunct Professor, School of Dentistry, Federal University of Pará (UFPA)

E-mail: davalavareda2@yahoo.com.br

⁸ Associate Professor III, School of Dentistry, Federal University of Pará (UFPA)

E-mail: vania@ufpa.br

⁹ Brazilian Air Force (FAB)

E-mail: suelenlavaredam@gmail.com

¹⁰ São Leopoldo Mandic Research Center

E-mail: sueann.lavareda@yahoo.com.br

¹¹ Origin: Undergraduate student of Dentistry at UFMA

E-mail: joao.pedrosa@discente.ufma.br

¹² Associate Professor III, School of Dentistry, Federal University of Pará (UFPA)

E-mail: sspedrosa@ufpa.br



INTRODUCTION

Despite the numerous technological advances in dentistry over the years, negative feelings are still common in this area¹. "Odontophobia," an irrational aversion to dentistry, is officially recognized and described in the Diagnostic and Statistical Manual of Mental Disorders and the International Statistical Classification of Diseases and Related Health Problems². The World Health Organization (WHO) classifies odontophobia as a real disease and estimates that it affects approximately 15 to 20% of the world's population³. This condition is divided into three stages of severity. Mild: characterized as dental anxiety:

1. Moderate: characterized as dental medium.
2. Severe: characterized by dental phobia.

In these cases, patients often postpone their dental treatments, show a lack of cooperation, and resort to the use of palliative medications, which can aggravate and seriously compromise oral health⁴. In Brazil, a study conducted in the Northeast region indicates that fear and anxiety about dentistry are significant, with an incidence ranging from 10% to 44%⁷.

Anxiety inside the dental office is often triggered by the use of instruments such as drills, needles, and syringes, as well as the sounds of motors and sudden movements, which can cause apprehension and make the experience unpleasant⁶. Anxious people tend to have a lower frequency of dental visits, resulting in a higher number of decayed or missing teeth and fewer fillings compared to non-anxious individuals. As a consequence, compromised oral health can negatively affect the patient's social life⁷.

The fear of dental treatment represents a challenge for both the patient and the dental surgeon⁸. This problem is closely linked to one's perception of the dentist. Therefore, it is crucial that the professional, in addition to their technical skills, is equipped with the necessary knowledge to identify and manage fear and anxiety effectively⁴. The Dental Anxiety Scale (DAS), developed by Corah, is the most widely used instrument internationally to identify odontophobia and determine its level, and is recognized for its simplicity and reliability in repeated tests⁹. The initial management of anxiety should be approached in a non-invasive way, establishing a good relationship between professional and patient, explaining the procedures and using behavioral techniques, such as concealing sharp instruments. In more severe cases, intervention with pharmacological therapies may be necessary¹⁰.

Clinical problems in the oral cavity, especially tooth loss, significantly impact the quality of life of many people, affecting various aspects such as function, appearance, interpersonal relationships and even professional opportunities¹¹. The main concerns of patients involve comfort, functionality and aesthetics. When these aspects do not correspond to the patient's expectations, it is



common to observe psychosocial responses such as anxiety, insecurity, reduced self-esteem, and introversion¹².

Oral rehabilitation plays a crucial role not only in treating diseases but also in promoting the social and mental well-being of patients. Maintaining good oral health is essential for the psychological and functional well-being of the individual¹³. The absence of teeth can affect important functions such as speech, due to changes in the morphology and musculature of the oral cavity, since teeth play a vital role in the production of sounds by obstructing the passage of air. In addition, tooth loss negatively impacts chewing ability. To solve these problems, the solution is oral prosthetic rehabilitation, which may include partial dentures, total dentures, or dental implants¹⁴.

Prosthodontics is the area of science that is dedicated to the replacement of the coronary portion of the teeth, aiming to restore lost functions, improve aesthetics, comfort and health of the patient. It also focuses on phonetics, posture, and restoring balance to the stomatognathic system¹⁷.

The present study aims to report the clinical case of a patient who faced oral complications due to odontophobia. In addition, it aims to demonstrate the rehabilitation treatment plan adopted, describing its stages and the results achieved.

CASE REPORT

A 50-year-old female patient went to the School of Dentistry of the Federal University of Pará (UFPA) and was treated at the Integrated Clinic III. She complained of pain, compromised aesthetics, inefficient chewing, low self-esteem and teeth in precarious condition, which negatively impacted her quality of life. She reported difficulties in eating, socializing, professional opportunities, and even weight loss. With a traumatic history in dental offices, the patient felt fearful and unable to seek the appropriate treatment for her teeth, leading her to seek help at UFPA.

During the first consultation, a detailed anamnesis was performed to assess the patient's degree of anxiety and fear, as well as her dental and medical history, main complaint, and oral hygiene habits. To diagnose anxiety, the Dental Anxiety Scale (DAS), developed by Corah in 1969, was used. This scale includes four items, each with five alternatives, specifically designed to measure the patient's level of dental anxiety by assigning scores from 4 to 20. A score of 15 or higher indicates a high level of anxiety. In the first consultation, the patient achieved a score of 16 and was classified as extremely anxious.

The use of the Dental Anxiety Scale (DAS) proved to be crucial for the proper conditioning of the patient. Due to the high levels of anxiety identified, a referral for psychological counseling was requested. In addition, to ensure that the consultations at the college's dental clinic were productive, it was necessary to establish a relationship of trust between the student, acting as a dentist, and the patient. In the first sessions, explanatory dialogues were held about each stage of the treatment.

Agreements were established to ensure the patient's comfort and confidence, including the assurance that the procedure would be stopped immediately in case of pain, the importance of attending appointments, being honest about the sensations during treatment, and aligning expectations regarding results. In addition, the basic instruments that would be used were presented, such as the clinical kit, the dental chair and its operation, as well as the clinic environment and the role of teachers in supervising students. The patient was receptive and understanding with these first approaches and, motivated by the severe oral problems and their impacts on her health and social life, was willing to change her perspective and accept the proposed treatments.

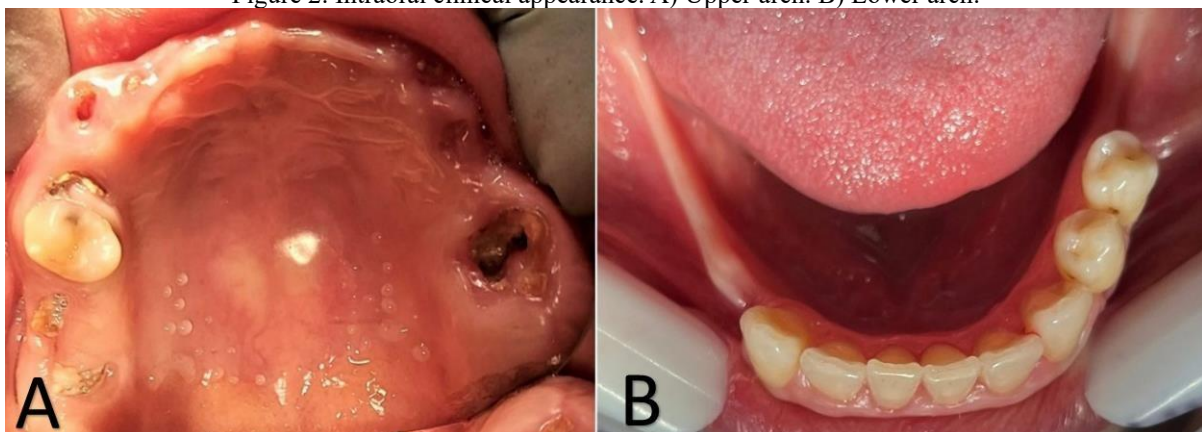
Extraoral clinical examination revealed a small asymmetry to the left side and a well-demarcated nasolabial fold. Upper lips drooping and covering the smile, allowing only the lower teeth to appear (Figures 1).

Figure 1. Clinical aspect. A) Frontal aspect showing the smile. B) Frontal aspect. C) Profile appearance.



Intraoral clinical examination revealed missing teeth in both upper and lower arches (Figure 2).

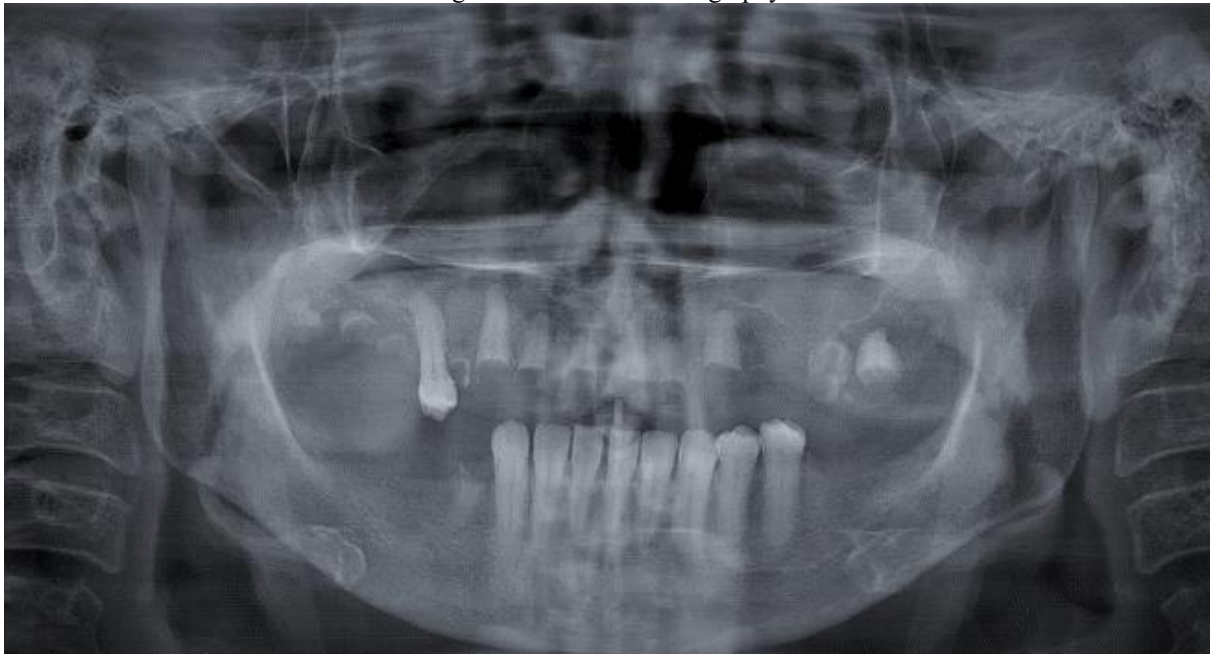
Figure 2. Intraoral clinical appearance. A) Upper arch. B) Lower arch.



In the upper arch, there was absence of a crown of multiple teeth, with the exception of element 15, without mobility and with caries lesions. A panoramic radiographic examination was

requested (Figure 3) where residual roots of elements 11, 12, 13, 21, 22, 23, 26 and 27 were identified in the upper arch, as well as fragments of elements 14, 16, 17, 24, 25 and 27. In the mandibular arch, the presence of all anterior elements was observed, in addition to premolars 34 and 35 and the residual root of element 44. The molars were absent in the lower arch.

Figure 3. Panoramic radiography.



The oral fibromucosa of the upper arch showed signs of inflammation (Figure 4), such as redness and pain to the touch reported by the patient.

Figure 4. Intraoral clinical appearance.



The diagnosis and treatment plan were carried out by the teams of the Integrated Dental Clinic III and IV of UFPA in the specialties of periodontics, with scaling of the lower elements; surgery to



remove residual roots, fragments and element 15; dentistry, to reduce retention in the cervical areas of the teeth; and prosthesis, for definitive total prosthesis (PT) in the upper arch and removable partial prosthesis (PRP) in the lower arch.

To start the oral treatment, two sessions of periodontal scaling were performed on the lower elements with manual Gracey curettes, smoothing and polishing. At the end of each session, oral health education was carried out, explaining brushing techniques and how caries occurs. Mouthwash with 0.12% chlorhexidine for 1 minute, 2x a day was recommended to assist in hygiene, mainly due to the residual roots that the patient had and that facilitated the accumulation of food in these regions, not being possible normal cleaning with a toothbrush. Then, study models were made using stock and alginate trays, poured with stone plaster.

The extraction of residual roots, dental fragments and element 15 was planned. The extraction was planned with analysis of clinical examinations, radiographic and complementary examinations (complete blood count and coagulogram with normal results) and blood pressure (110 x 80 mmHg). In the preoperative period, the patient was instructed once again about the procedure, talking about which extractions would be performed in each session and the importance of the treatment. Due to the patient's anxiety, the extractions were performed in 4 sessions, calmly and always talking to the patient during the procedure to distract her and maintain confidence in the treatment. In the first session, the residual roots of elements 11, 21, 12 and 22 were removed. In the second session, the residual root of element 13, the crown fragment of element 14 and element 15 were removed. In the third session, the residual roots of elements 23, 26 and 27 and crown fragments of elements 24 and 25 were removed. In the fourth session, the dental fragments of elements 16 and 17 and the residual root of element 44 were removed.

Before all surgical procedures, the patient's blood pressure was checked, antisepsis was performed with 2% chlorhexidine on the face and 0.12% chlorhexidine mouthwash to reduce the microbial load. The table with the sterile instruments was always covered with sterile TNT when the patient arrived at the clinic, in order to reduce her anxiety about the procedure and visualization of the instruments.

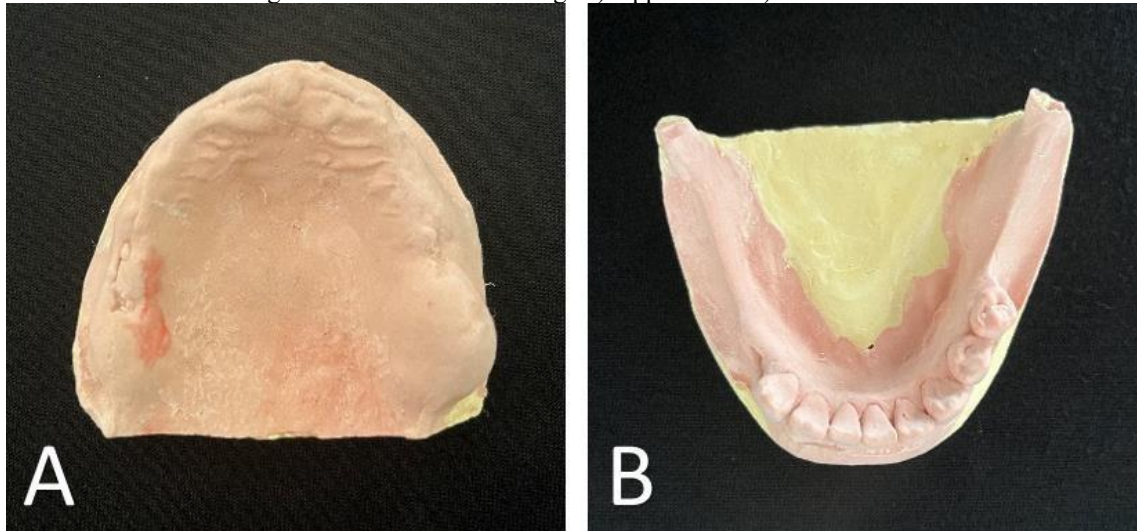
Extractions were performed with scalpel blades around the edges of the roots, molt detacher, levers and forceps. At the end, curettage and irrigation of the socket were performed with saline solution, in order to remove any lesions and residues. The sutures were performed with non-resorbable silk thread to keep the clot stable and improve healing.

Postoperative orientations, given verbally and in writing, consisted of ice packs to reduce edema; avoid physical exertion and exposure to the sun; pasty and cold diet in the first 48 hours after surgery. The prescription was prescribed with anti-inflammatory Nimesulide 100mg, 1 tablet every 12 hours for 3 days; and analgesic Dipyron 500mg, 1 tablet every 6 hours in cases of pain. The

medications were prescribed according to what the patient already had at home and was used to taking. After 7 days, the sutures were removed. The patient healed well, as expected, and there was no report of postoperative pain.

After the oral cavity was adjusted, with the extractions performed, alginate and a stock tray were used to make the anatomical impression of the upper and lower arches (Figure 5). With the plaster models ready, the study for the planning of the prostheses was carried out.

Figure 5. Anatomical molding. A) Upper arch. B) Lower arch.



Based on the higher education model, an individual tray was made with colorless acrylic resin (Figure 6). After the adjustments of the individual tray, the mixed compression technique was performed with the godiva for the peripheral seal and the silica involving the entire platable area, to obtain the functional model. From the model, two test bases were made; the first to perform the registration with a facial arch and assembly of the upper model in the ASA, and the second with a wax roller for the interocclusal registration and marking of the reference lines (Figure 6).

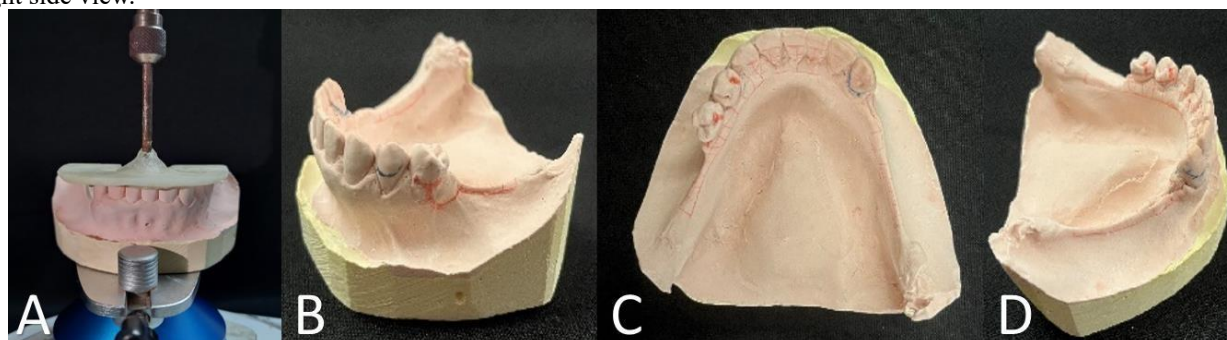
Figure 6. Individual tray and test bases. A) Individual tray. (bc) Proof bases.



With the lower study model, the study and planning of the PRP began. With posterior bilateral tooth loss, the case is characterized as Class I in the Kennedy classification, with elements 43 and 35 as direct retainers. Element 34 is characterized as an indirect retainer.

The planning of the structure of the PPR was carried out with the delineator. It started with the analyzer tip to define the insertion trajectory of the prosthesis using the Roach method. Next, the calibrating tips were used to verify the retentive areas of the ridge and teeth on the buccal, lingual and distal surfaces of the direct and indirect retainers. After defining the plan and fixing the table, a transfer plate was made with colorless acrylic resin and screw. To finalize the design, the prosthetic equator was traced with the graphite tips, bypassing the direct and indirect retainers. The design of the structure of the PRP was then planned, with the choice of tip action clamps, niche location and lingual plate (Figure 7).

Figure 7. Delineation process. A) Transfer paca. B) Left lateral view design. C) Outline by top view. D) Delineation by right side view.

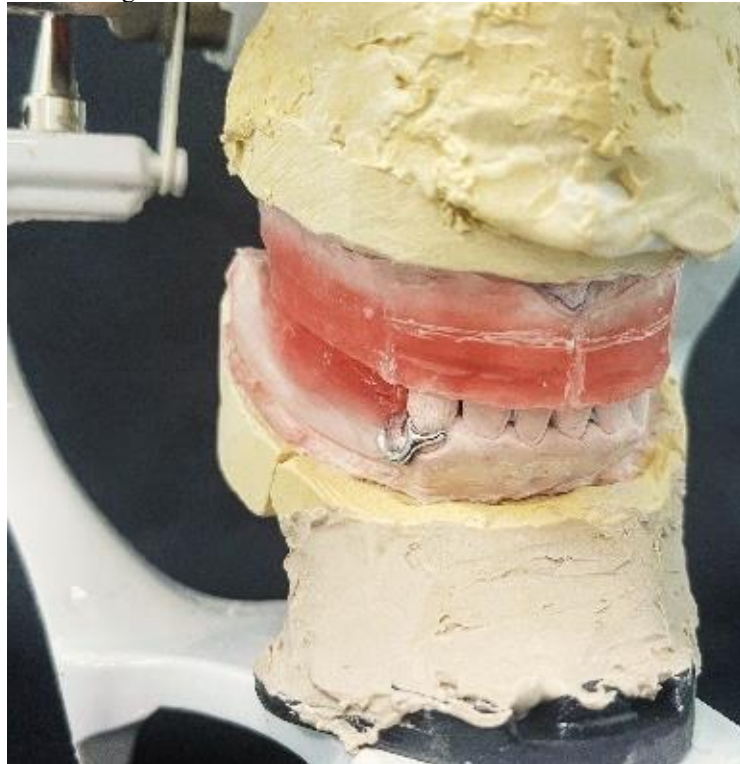


To improve the adaptation of the clamps, stability of the prosthesis and eliminate retentions, restorations were performed with composite resin in elements 35, vestibulo-distal face and 43 in distal face. The faces were submitted to the application of 37% phosphoric acid for 15 seconds. After washing and drying with absorbent paper, the adhesive system used was the 3M Single Bond Universal, with the aid of the disposable microbrush applicator. The resin used was Opallis from FGM, color A3.5. A new study model was obtained with the new alterations with resin and went through all the previous steps in the eyeliner in a judicious way. With the modifications, wear was performed on the buccal and distal surfaces of element 35 with an eyeliner pen holder and a PM82 straight drill. The preparation of a transfer casquet was necessary to perform the mouth preparation.

In the preparation of the mouth, niches were made in the occlusal-mesial of teeth 34 and 35, in the cingulate of tooth 43 and in the buccal surfaces of teeth 35 and 43 for adaptation of the staples. Then, functional molding was performed with condensation silicone in two steps (first with heavy silicone followed by light silicon) to obtain the working model. The work model was outlined and designed to be sent to the prosthesis laboratory for the manufacture of the metal structure, which was later adapted in the mouth, showing good adaptation.

A lower test base with a wax roller in the edentulous regions was made on top of the metal structure for the interocclusal record together with the upper test base, and then for the assembly of the lower functional model in ASA. The position of the mandible in relation to the maxilla, in the centric relationship and definition of the Vertical Dimension of Occlusion (OLD) were analyzed, based on phonetic, aesthetic, metric and facial proportions tests. With the oral test bases, reference lines were marked, and artificial teeth were selected. In the same session, the selection of the color of the gums was also performed. The selected teeth were on the Trilux scale and the color was A2. The articulator with the models, test bases and markings was sent to the prosthetic laboratory for the assembly of the lower and upper teeth (Figure 8). In the following session, with the assembly of the artificial teeth done, the prostheses in the mouth were tested for the necessary functional and aesthetic adjustments. Then, the prostheses were returned to the laboratory for acrylization.

Figure 8. Articulator with the models and test bases.



The prostheses were installed in the following session. Zincoenolic base paste was brushed on the prostheses to make the adjustments and not cause injury to the patient's gums, identifying points of friction. For this, the prostheses were placed in the mouth and the patient was asked to bite and make different movements with the mandible. The places where the base paste was removed had to be relieved, because there was pressure with the mucosa in a disproportionate way to the rest of the prosthesis, which could cause injuries to the oral tissues (Figure 9).

At the end of the case, the patient was instructed again regarding oral hygiene and care with the prostheses. The importance of visits to the dentist was reinforced, and the Corah Scale was

performed again to verify the patient's evolution regarding Odontophobia during the dental treatment of the present study. The result of the Scale was a score of 9, characterizing the patient as mildly anxious.

Figure 9. Final clinical aspect. A) Frontal clinical appearance with smile. B) Frontal clinical appearance without smiling. C) Intraoral aspect of the superior arch. D) Intraoral aspect of the inferior arch. E) Dental prostheses.



DISCUSSION

Fear of dental treatment usually originates from painful and traumatic experiences experienced in childhood or adolescence, in addition to a lack of knowledge about dental procedures^{5,16}. These factors were determinant for the development of odontophobia in adulthood of the patient described in the clinical case. Due to the fear of the dental office and the lack of proper guidance on oral hygiene at home, the patient faced several negative consequences for her oral health. Commonly, she postponed treatments whenever she experienced dental pain, resorting to the use of medications such as painkillers and anti-inflammatories, which only exacerbated the initial problem. This resulted in significant tooth loss and both aesthetic and functional impairment.

The literature indicates that professionals who identify patients with fear or anxiety should investigate which specific procedure triggered this condition and offer an appropriate reception to minimize the problem. Welcoming is recognized as an effective method in the treatment of odontophobia and is a fundamental aspect of humanized care^{8,18}. In the case in question, the effective reception of the patient, the willingness to dialogue and respect were crucial for the acceptance and completion of the treatment. The use of the Dental Anxiety Scale (DAS), developed by Corah, is especially valued for the diagnosis of dental anxiety. An article published in 2004 highlighted that, among three scales evaluated in a study, the DAS was considered the most reliable and capable of establishing an appropriate treatment¹⁹. Based on this evaluation, the DAS was the tool chosen to assist in the diagnosis and conditioning of the patient in this clinical case.

Along with the identification of odontophobia, it is recommended that the dentist refer patients to a psychologist or psychotherapist. The goal is for them to receive specialized support to overcome the fear and the various obstacles that affect their life in general⁴. In the case under discussion, the patient was referred to a psychologist, who played a crucial role in helping her to face dental care in a more effective and less distressing way.

The patient's main complaint was compromised aesthetics and inadequate masticatory function, which affected her social life and ability to eat properly, also impacting her self-esteem. According to the literature, women often have higher levels of anxiety and negative feelings related to tooth loss, resulting in lower confidence^{8,17}. The treatment plan was chosen based on these aspects, aiming to restore the patient's confidence in herself and improve her social relationships.

Dentures represent a viable alternative for patients with a history of odontophobia, as they usually do not require prolonged surgeries or preparations, making treatment more easily acceptable. Curiously, the literature does not present studies that specifically relate oral rehabilitation with prostheses to the treatment of damage caused by odontophobia. This aspect highlights a potential area of research that could further explore how prosthetics can alleviate the psychological impacts associated with fear of dental treatments.

In the present case, after the installation of the prostheses, there was a considerable improvement in the patient's self-esteem and social life, in addition to a decrease in anxiety and an improvement in diet. Masticatory and aesthetic functions were restored, providing the patient with a significantly improved quality of life.

CONCLUSION

Understanding the patient's general conditions, in addition to the disease itself that motivated her to seek dental help, was crucial for adequate conditioning, diagnosis, and elaboration of the treatment plan. Based on the clinical case presented and subsequent discussions, it is clear that the



practitioner needs to go beyond technical skills, deeply understanding the patient's expectations and needs. Patients with odontophobia need a reception and rehabilitation that is aligned with their expectations. Oral rehabilitation using removable prostheses represents a less traumatic and effective option, restoring oral health, as well as the patient's function and aesthetics.

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INFORMED CONSENT FORM



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FACULDADE DE ODONTOLOGIA

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

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Belém-PA, 09/07/21.

Lilía de Souza

Assinatura do paciente

A meta-model for formulating digital transformation strategies for SMEs: A knowledge management-based approach

 <https://doi.org/10.56238/sevned2024.014-003>

Vinícius Barreto Klein¹, José Leomar Todesco² and Denilson Sell³

ABSTRACT

Digital Transformation (DT) is a new socio-technical paradigm that has been reshaping society. The intensification of the use of the most recent digital technologies has triggered the need for significant changes in organizations (e.g. educational institutions, physical commerce), and in their different organizational elements (e.g. processes, technologies, culture). In this context, the problem of small and medium-sized enterprises (SMEs) stands out. They have great value for social well-being due to their ability to generate work. However, they have a long way to go on the path to digital transformation, compared to large companies. Its specific limitations, such as the scarcity of financial resources and the lack of knowledge to deal with DT, accentuate this difficulty. This implies the need to know how to design a more effective DT strategy or process, which makes better use of its scarce resources and which strategically aligns them with the potential of digital technologies. Therefore, with an approach based on knowledge management and interdisciplinary research, the following research question was investigated: how to support SMEs to face challenges and take advantage of the opportunities brought through digital transformation? Therefore, under a systemic view of TD in organizations, a meta-model was proposed, which focuses on the strategic level and initiates the adaptation of business models, through cycles of adaptation and response to new external demands. As theoretical and basic foundations, the Cesm method, the Canvas Business Model, and the organizational resilience mechanisms were used, linked to the Seci knowledge spiral. As a methodological approach, systematic reviews of scientific articles, case studies and business reports were used, combined with the Design Science Research Process (DSRP). The adopted design involved iterative and collaborative steps of conceptual review and refinement of the constructed meta-model, which was subjected to conceptual review through the submission of articles and the analysis of two domain experts in DT. As a final result, the developed artifact is presented, which structures three phases to guide the TD process, focusing on the strategic level of organizations, also recommending steps and samples of support materials (examples of tools to assist TD). As delimitations, it is highlighted that the meta-model does not address elements inherent to the tactical and operational levels of organizations. As limitations, it is pointed out that larger and more diverse samples can be used in the future. Its practical implications are to guide SMEs, indicating where and how to start DT, using phases and steps to guide this process.. As future work, its instantiation in various sectors and organizations of different sizes is recommended, as well as the use of different tools, and measurement of long-term results.

Keywords: Digital Transformation, Strategies to implement Digital Transformation, Conceptual meta-model, Organizational resilience, Knowledge Engineering and Management, SMEs.

¹ Dr.
Instituto Federal Catarinense (IFC) - Campus Brusque.
E-mail: vinicius.klein@ifc.edu.br

² Dr.
Federal University of Santa Catarina (UFSC).
E-mail: tite@egc.ufsc.br

³ Dr.
Federal University of Santa Catarina (UFSC).
E-mail: denilson@stela.org.br

INTRODUCTION

According to Weiss (2019), digital transformation (DT) can be understood as a socio-technical macro-process, resulting from a significant change in technological paradigms, essentially characterized by the migration from analog to digital forms of production. Its impact permeates various sectors of society, with information technologies and their continuous evolution as key protagonists of this new reality, promoting a culture where the use of digital technologies is increasingly intensive, and which reshapes people's behavior.

The origin of DT can be traced from the emergence of electronic computers and the birth of Computer Science, to the most recent advances in the field of information and communication technologies (ICT). According to Legner *et al.* (2017), the continuous evolution of computational scientific knowledge, through the constant miniaturization of *hardware*, increased connectivity, and storage and processing capacity, has been transforming not only its academic environment of origin with new research trends, but also several sectors of society. There is no shortage of illustrations of this impact, as can be seen in industry 4.0, in e-commerce platform models, in *smartphones and their applications*, in social networks, in the big *data phenomenon* and in the advancement of artificial intelligence, for example.

As an illustrative result of this new era, it can be highlighted that digital technologies have redesigned the hierarchy of valuable brands in recent decades, creating spaces for new entrants. A survey by Interbrands (TREVAIL, 2019), which has collected data since 2001, highlighted that business models based on digital technologies for innovation allowed classic and consolidated giants such as Coca-Cola and McDonalds to be overtaken in that period (2001-2019) by four IT companies (Apple, Google, Amazon and Microsoft). Not to mention the explosion of *streaming services* and *smartphone apps* (e.g., Uber, WhatsApp, etc.).

However, far from the reality of *big tech*, SMEs struggle to adapt to this new reality. In addition to its financial scarcity compared to large or giant ones, its limitations include a lack of digitally trained human resources, digital technologies themselves, management capacity, lack of strategic vision and knowledge management, and loss of tacit knowledge due to the loss of key employees to large companies (BRUSSEVICH; DABLA-NORRIS; KHALID, 2020 DURST; WILHELM, 2011; GARENGO; BIAZZO; BITITCI, 2005).

Among the inherent weaknesses of SMEs, this work focuses on the lack of strategic vision and knowledge to address DT. To address DT, it is necessary to understand knowledge as a key resource for the organization (*knowledge-based view*), and that therefore it is not enough just to acquire digital technologies, and that other factors are necessary to extract more value from its potential. Therefore, it is emphasized in this work that engineering and knowledge management have in their framework useful methods, techniques and tools to support the DT process in organizations.

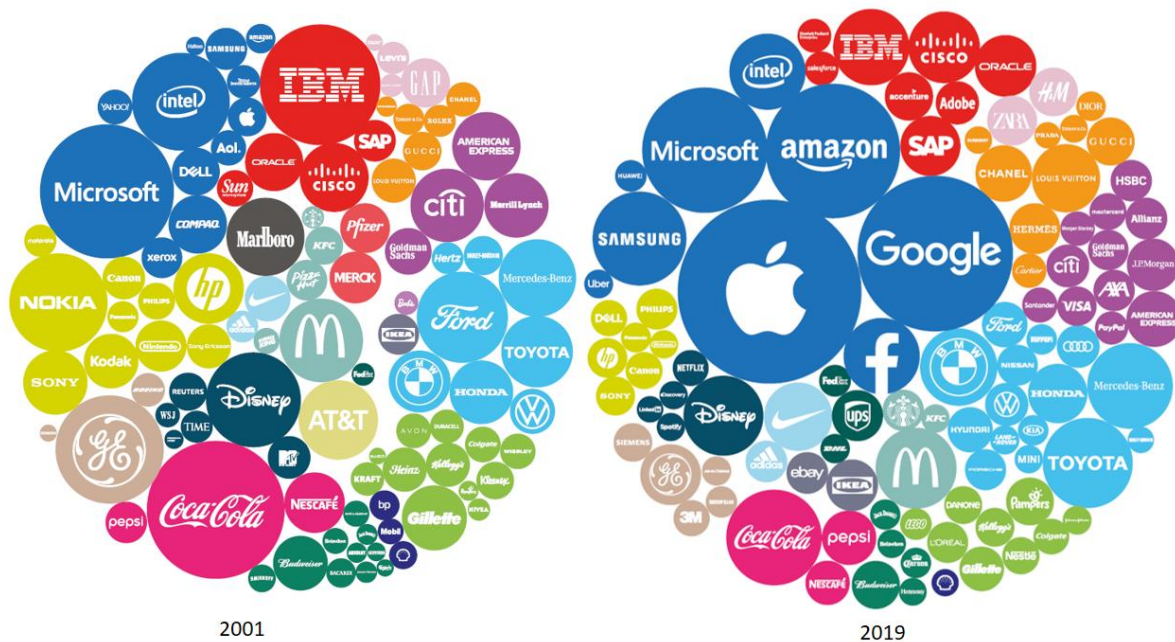
The triad of people (organizational culture), processes and technologies has been one of the pillars of the most recent KM studies (NEVES; VARVAKIS; FIALHO, 2018), and can be used as a starting point to model an artifact (meta-model) that guides the DT process, as well as studies that structure processes to better manage organizational knowledge, so that it promotes organizational innovation and resilience (NONAKA; TOYAMA; KONNO, 2000; VENZIN; KROGH; ROOS, 1998; VIAL, 2019).

Therefore, this work aims to present a meta-model, based on knowledge management, with a view to deliberating digital transformation strategies for small and medium-sized companies. A meta-model is presented that incorporates concepts and principles necessary to guide the development of strategies to guide the beginning of the digital transformation process, focusing on the specificities of SMEs. In other words, based on the vision, methods and techniques of engineering and knowledge management, it seeks to answer the following research question: how to support SMEs to face the challenges and take advantage of the opportunities brought by digital transformation?

THEORETICAL BACKGROUND

DT is a relevant and wide-ranging research topic, which arises in the technological field, but impacts society as a whole. According to Pacheco, Santos and Wahrhaftig (2020, p. 102), DT is a broad and disruptive phenomenon, characterized by a "[...] structural change in the means of production and services, caused by digital digitalization and engagement, of technological, economic, cultural, social and environmental impacts on individuals, organizations and regions". This phenomenon is a consequence of the evolution of computer sciences and their information systems (LEGNER *et al.*, 2017), which have revolutionized the *modus operandi* from various sectors of society, creating behaviors and, consequently, new demands for products and services (ARKAN, 2016; MAYNARD, 2015). For Legner *et al.*, (2017) DT can be better understood in three key moments: the popularization of personal computers, which began in the 1980s; the emergence of the internet and the future of the web as a global communication infrastructure (1990s); and the convergence of SMAC technologies – *social, Mobile, analytics* and *Cloud* In the form of Dsocial networks, the integration between machine learning (artificial intelligence) and the phenomenon *Big Data*, and in applications for mobile devices, making computing ubiquitous, and continuously and disruptively impacting important economic sectors of society (MAHRAZ; BENABBOU; BERRADO, 2019). In short, TD has been creating a new logic of consumer relations for some time, based on the most recent digital technologies of each era (PACHECO; SAINTS; WAHRHAFTIG, 2019), and it is no different now, triggering the need for studies that help to understand its nature (AIRES, 2020; LEGNER *et al.*, 2017; MAHRAZ; BENABBOU; BERRADO, 2019; PACHECO; SANTOS; WAHRHAFTIG, 2019; VIAL, 2019).

Illustrating the impact that TD has been having on society, it highlights its potential to recreate market hierarchies, displacing traditional brands and creating space for new entrants. Figure 1 summarizes this impact, through a survey of the most valuable brands in the world, comparing a cut made in 2001 to another in 2019. It shows the increased strength caused by business models based on digital technologies.



Source: Adapted from Trevail (2019, p. 6).

However, far from the reality of *big techs*, this work focuses on SMEs (Exhibit 1). Its specificities, such as its scarcity of financial resources, lack of strategy and gaps in specialized knowledge, make it difficult to respond to the challenges posed by DT. This choice is also justified due to its key role in the generation of work, and therefore of social well-being, in economies around the world, whether in industrially advanced or emerging countries (ROBU, 2013). In Brazil, they correspond to approximately 95% of the total number of companies in the industrial sector, producing approximately 42% of jobs and 22.5% of GDP (2011 average) (SEBRAE, 2014, p. 55).

Frame 1 – Classification of SMEs: size and sector

Postage	Sectors	
	Services and trade	Industry
Microenterprise	Up to 9 people occupied	Up to 19 people occupied
Small Business	From 10 to 49 people employed	From 20 to 99 people employed
Medium-sized business	From 50 to 99 people employed	From 100 to 499 employed persons
Large company	Over 100 people occupied	Over 500 people employed

Source: Sebrae (2020, p. 16).

According to Sebrae (2020, p. 6), SMEs produce about 30% of the country's wealth, which has grown in the last 35 years. The same report points out that SMEs are strategic to minimize the effects of economic crises, as they tend to lay off less. For example, between 2006 and 2019, SMEs showed a positive result in job creation, being responsible for the creation of about 13.5 million jobs, unlike medium and large companies, which closed about 1.1 million jobs in the same period.

METHODOLOGY

The present work has as its conceptual background a pragmatic view of research. According to Kinouchi (2007, p. 215), pragmatism is a philosophical view that is concerned with the practical consequences of the issues investigated. Pragmatism reflects the idea of searching for methods to address problems of practical utility (KINOUCI, 2007, p. 215), aiming at the new systemic state, resulting from the application of previously constructed scientific knowledge.

Based on the objective of this work, it can be emphasized that it can be classified as a technological research, because it is the study of the design of technological artifacts, which generate artificial and not natural phenomena (CUPANI, 2006). In this case, it is understood that technological research is in the field of knowledge related to the planning, implementation, use, adjustments, maintenance and monitoring of artifacts in the light of scientific knowledge (BUNGE, 1985, p. 231). In this sense, technology approaches problems in a practice-oriented way, through scientific research (BUNGE, 1985, p. 237).

According to Hevner *et al.* (2004, p. 77), technological artifacts can be constructs (vocabulary and symbols), models (abstractions and representations), methods (algorithms and practices) and instantiations (the implemented systems or their prototypes). In this sense, the present research delivers a technological artifact that is close to the model definition of Hevner *et al.* (2004, p. 77), as it abstracts the results found in the literature, adding instructions for their instantiation. This artifact is classified as a meta-model, as it is built from the integration of different models of DT orientation for organizations, through an approach based on KM (knowledge management), which articulates KBV (*knowledge-based view*) and RO (organizational resilience) in the search for specific guidelines and tools for SMEs.

Therefore, it is understood that a meta-model is a model that consists of instructions modeled from other sets of models, which serve to guide the construction (instantiation) of new models themselves. For example, new business models and new management models that integrate guidelines from other sets of different reference models (JEUSFELD, 2009; CARDOSO *et al.*, 2012). In other words, just as models are abstractions of a reality, meta-models are abstractions of other models (JEUSFELD, 2009).

Therefore, as it was then an object of sociotechnical study, a pragmatic research approach was used (GOLDKHUL, 2004), applying the process model prescribed by DSRM (*Design Science Research Methodology*) (JUNIOR FREITAS *et al.* 2017; PEFFERS *et al.*, 2007), which foresees ETPAS to be run in a cyclical manner, as described in Table 2:

Chart 2 – Research Process according to DSRM

Process Stage (DSRM)	Description	Activities carried out to implement the step
Problem Definition	<p>Analyze and describe the problem, motivation, and justification, as well as emphasize the value of the solution.</p> <p>Know the current state of the problem and the importance of its solution (PEFFERS <i>et al.</i>, 2007).</p>	<p>Exploratory research, through two systematic reviews.</p> <p>Systematic Review 1: Digital Transformation, Society 5.0, Industry 4.0, SMEs, Challenges and Opportunities. Focus on scientific articles and reports produced by companies in the technology sector.</p>
		<p>Revisão Sistemática 2: <i>SMEs; Covid-19; response; opportunities; challenges; digital transformation; strengths; weaknesses; threats.</i></p> <p>Improvement of the model, focusing on the development of specific DT strategies for SMEs, based on their reaction to the acceleration caused by the pandemic.</p>
Solution Objectives	<p>Infer the goals of the solution from the problem definition. Describe how a new artifact can support addressing the proposed problem (PEFFERS <i>et al.</i>, 2007).</p> <p>Incremental refinement of research objectives and problem.</p>	<p>Inductive data analysis:</p> <p>Meetings between the authors of this work.</p>
Artifact design and development (part 1)	<p>Create the artifact (meta-model) (HEVNER <i>et al.</i>, 2004). This activity includes determining the desired functionality for the artifact, its architecture, and then its implementation.</p>	<p>Modeling (abstraction) of the key elements to compose the meta-model. Inductive logic, based on the materials previously raised, through cyclical meetings with the advisor(s), producing an incremental advance in the artifact.</p> <p>Application of the CESM method (BUNGE, 1995) to systematize the abstraction of the key aspects of DT in SMEs.</p>
Process Stage (DSRM)	Description	Activities carried out to implement the step
Artifact design and development (part 2)	<p>At this stage, the conceptual review of the model under development consisted of the analysis and incorporation of <i>feedback</i> from external reviewers of the work. First, the initial abstraction of the key aspects for TD in SMEs was submitted to the congress (CiKi), which incorporated the indications for improvement given by the reviewers of the event.</p> <p>Then, after new evolutions of the model, with the structuring of the CESM for DT, the use of RO and the Canvas for the elaboration of strategies for SMEs, a version of the conceptual model was elaborated and submitted to the journal KPM – Qualis A2). The suggestions of the paper's international reviewers were also incorporated and improved the conceptual framework of the</p>	<p>Conceptual revision of the artifact, through submission to the CiKi congress (International Congress of Knowledge and Innovation).</p> <p>http://dx.doi.org/10.48090/ciki.v1i1.922</p> <p>Main challenges and opportunities, first abstraction of the key aspects for DT in SMEs: initial digitalization, process efficiency, business intelligence, cultural resignification, business model review.</p> <p>Communication of the results through the publication of the article in the annals of the event.</p>
		<p>Conceptual review (external and international) of the evolved artifact. Submission to the journal <i>Knowledge Process Management</i> Wiley Online Library.</p> <p>https://doi.org/10.1002/kpm.1660</p> <p>Application of CESM to the aspects abstracted in the previous step.</p> <p>After further readings, a conceptual model for a DT strategy was redesigned, focusing on knowledge as the main element and on the review of elements of the <i>Canvas Business model</i>. Use of engineering and knowledge management (Seci) and organizational resilience mechanisms (monitoring, anticipation, learning and response) as a basis.</p> <p>Notes from the journal's reviewers incorporated into the</p>

Process Stage (DSRM)	Description	Activities carried out to implement the step
	artifact.	model. Communication of results through the publication of articles and books.
Artifact design and development (part 3)	This part continues the previous one, adding a conceptual review of the artifact under development, together with different domain experts. It involved presenting the artifact to two domain experts, for the incorporation of different contributions.	<p>Incorporation of phases, steps and tools to guide future instantiation of the meta-model.</p> <p>Conceptual Review via Doctoral Qualification Board. Conceptual review with two major domain experts (in TD), who contributed their evaluations of the developed artifact.</p> <p>Systematic Review 3: search for practical guidelines for instantiation of the meta-model. Keywords: 'digital transformation', 'SMEs', 'roadmap', 'steps', 'models', 'meta-models', 'strategies', 'guidelines' and 'process model'.</p>
Consistency and feasibility analysis with SMEs	Illustrate how the artifact can be used. It may involve its use in a real-world scenario, simulation, a case study, or another appropriate method. Important to describe the knowledge (resource) of how to use the artifact to address the problem. Results are detailed in the <i>Consistency Analysis chapter</i> .	<p>Demonstration of the phases and stages proposed for SMEs. Verification carried out with a sample of four entrepreneurs from different sectors, who evaluated the possible contributions of the artifact. Limited sample size due to the difficult access and availability of entrepreneurs, given the post-pandemic and recession scenario. More details in the third chapter.</p>
Communication (Publication of results)	Communicate in article publications the problem and its importance, the artifact, its usefulness and originality, as well as the rigor of the methods adopted and their effectiveness to researchers and other relevant audiences, such as professionals in the sector.	Stage carried out after each of the two previous cycles, of design and development of the artifact.
		Publication of an article in CiKi 2020. <i>Digital Transformation: challenges and opportunities for SMEs</i> , on the relevance of the problem and key aspects of DT in SMEs.
Process Stage (DSRM)	Description	Activities carried out to implement the step
Communication (Publication of results)	Communicate in article publications the problem and its importance, the artifact, its usefulness and originality, as well as the rigor of the methods adopted and their effectiveness to researchers and other relevant audiences, such as professionals in the sector. Results described in this chapter.	<p>Publication of an International Article (A2) in the journal <i>Knowledge and Process Management</i>, v. 28, n. 2, p. 117-133, 2021, from the Wiley Online Library, "<i>COVID-19 crisis and SMEs responses: The role of digital transformation</i>", on the articulation between engineering and knowledge management, organizational resilience and digital transformation, along with a solution outline for developing an SME strategy (initial conceptual model). Currently with 395 citations, the article appears on the first page of the Google Scholar search engine for the keywords: digital transformation, SMEs, organizational resilience.</p>
		<p>Final publication (article/book) .</p> <p>Includes phases and steps for TD, review with domain experts, SMB demonstration, and final recommendations.</p>

Source: adapted by the author from Peffers *et al.* (2007) and Júnior Freitas *et al* (2017)

As can be seen in Chart 2, different research procedures were implemented to instantiate the steps recommended by the DSRM. Systematic literature reviews and interviews with domain experts were conducted. Each phase was visited more than once, in a cyclical manner, according to the need for improvement, producing an incremental evolution of the meta-model.

Finally, the partial result of the work was submitted for publication in the International Congress of Knowledge and Innovation – ciki (KLEIN and TODESCO, 2020) and in the international journal of Qualis A2, *Knowledge and Process Management* (KLEIN and TODESCO,

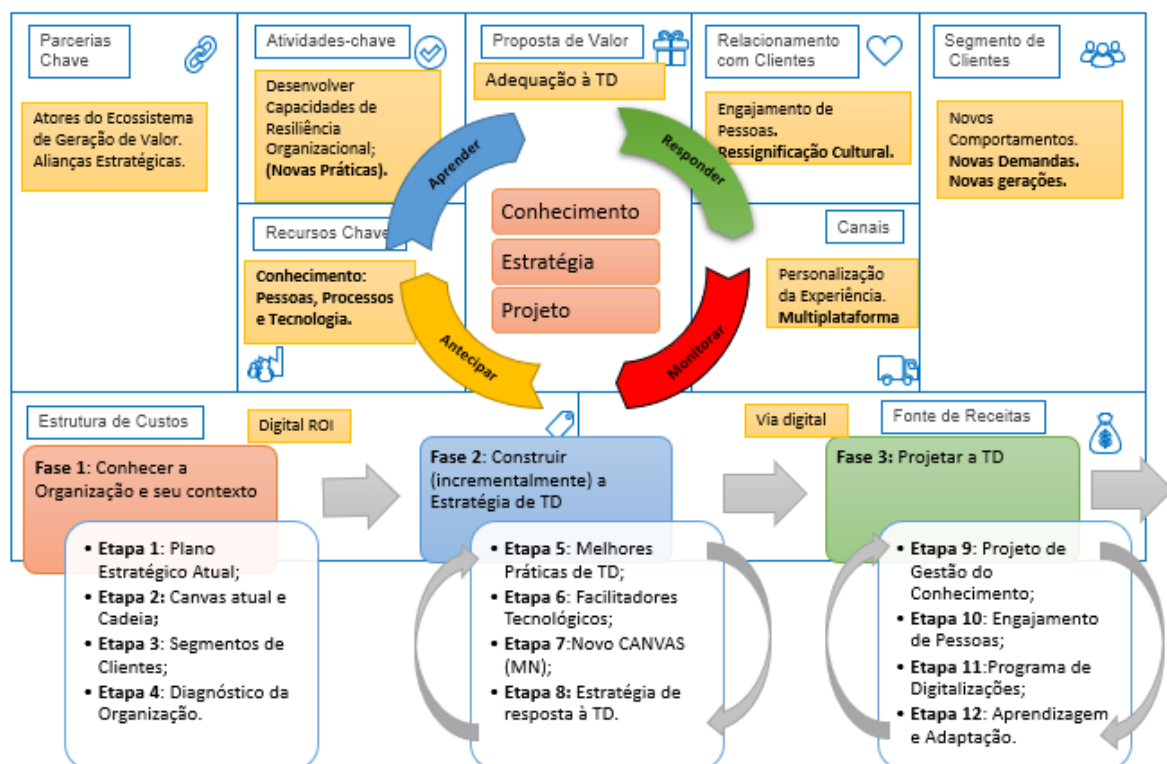
2021), whose reviews provided by the reviewers of the event and the journal were incorporated into the artifact, as well as the recommendations provided by the two domain experts interviewed, until it reaches its final version, presented below.

RESULTS

First, the general functioning of the artifact is explained, and then each of the three phases, of four stages each, is detailed.

OVERVIEW

The meta-model presented articulates the knowledge raised in the previous one, and seeks to present it in a more visual and clear way (Figura 2), and oriented to practice, to facilitate its implementation and absorption by SMEs. Three phases were structured, each recommending four (optional) steps, to be selected and implemented by its user, according to the context in which it is inserted.

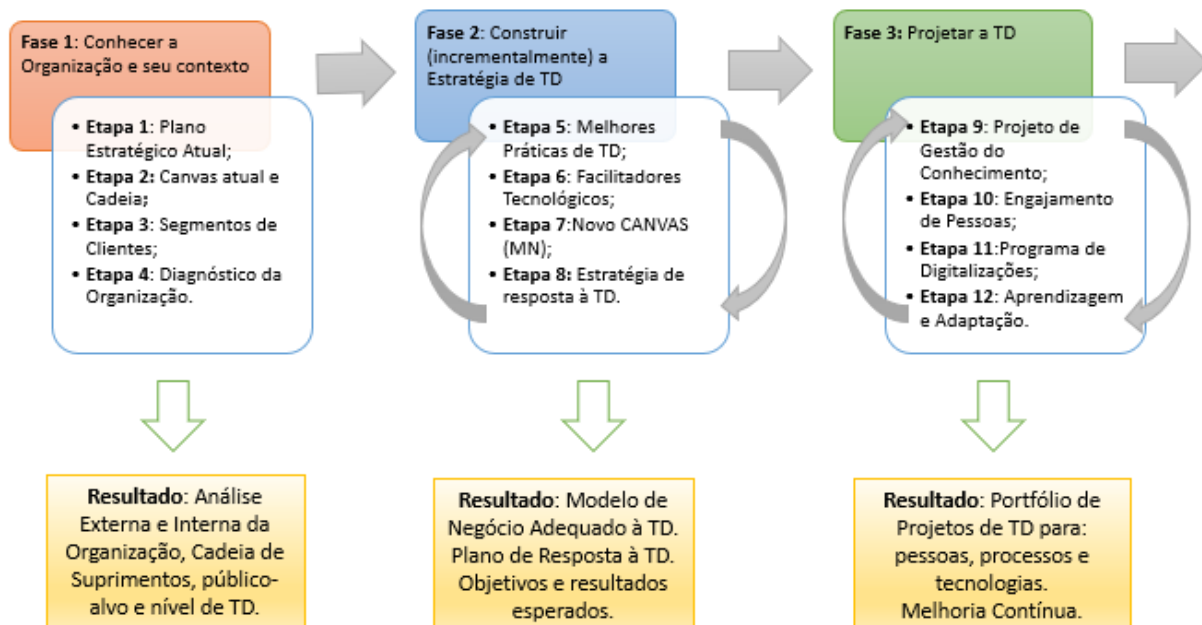


Source: prepared by the author.

As can be seen in figure 2, the guiding elements for the proposed meta-model are represented, using the structure of the *Canvas Business Model* (OSTERWALDER, 2004), with knowledge as a key resource for innovation (*knowledge-based view*) (CURADO, 2006 ; NONAKA; TOYAMA;

KONNO, 2000), which is the core of the organizational resilience mechanism (HOLLNAGEL, 2010).

To facilitate the understanding of this proposal, Figure 3 focuses on the sequential structure of the recommended phases and steps. Its structure is organized into three major phases, each with four stages, recommended support materials (tools), and expected results:



Source: prepared by the authors.

Below, each phase is detailed, as well as its stages.

PHASE 1: GET TO KNOW THE ORGANIZATION AND CONTEXT

The objective of this phase is to explain the knowledge related to strategic elements of the organization. The aim is to carry out a diagnosis of the strategic level that allows to know the organization and its key elements, as well as to have an influence on the construction of a specific strategy for DT. It seeks to analyze elements internal and external to the organization, such as the requirements of customer segments and partners in the supply chain, actors in the supply chain and the ecosystem as a whole (e.g., service providers, financing agents). The approximate level of digitalization is also estimated here, in order to identify the difficulties or the starting point for the DT project to be developed.

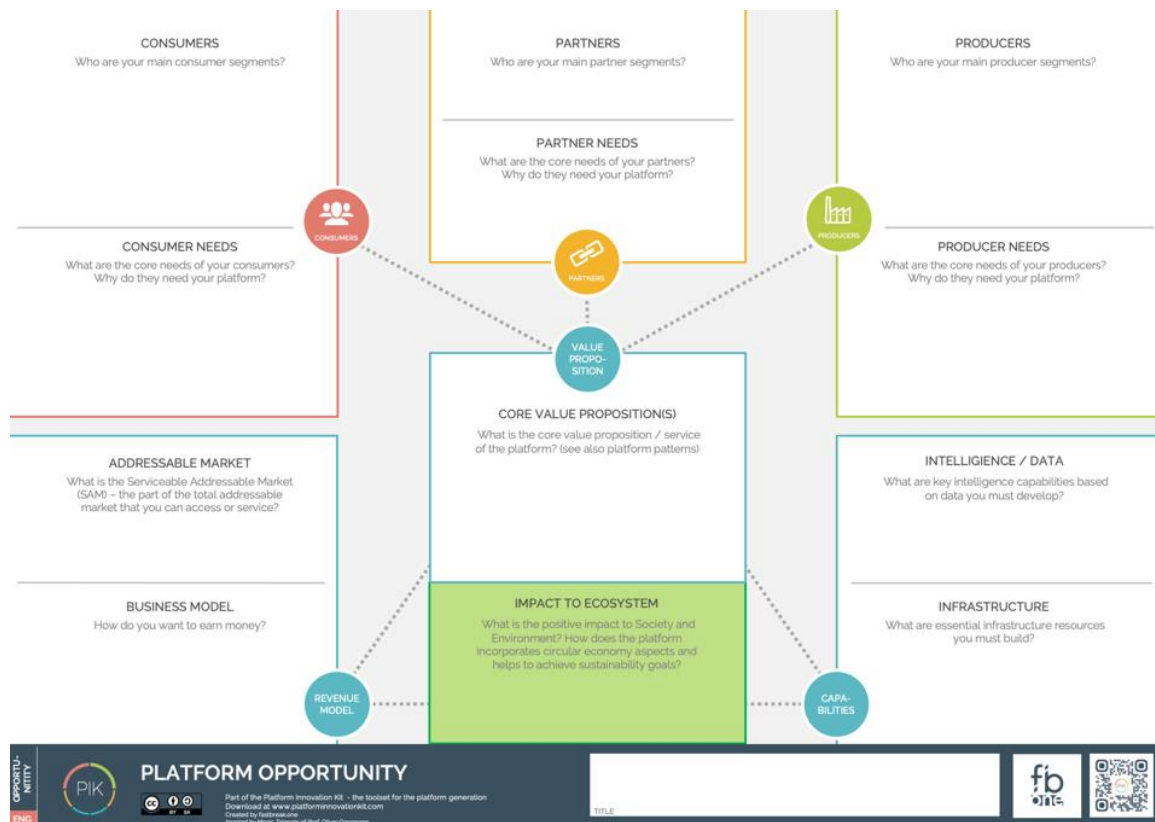
Phase 1 - Step 1: Know the current Strategic Plan

This stage aims to know the current (or absent) Strategic Plan in the organization in order to identify key attributes that may influence the ongoing DT project, inherent to the strategic level. It is

recommended to explain knowledge about the organization's current strategic planning. Its vision, mission, and values, its internal strengths and weaknesses, external opportunities and threats, as well as its strategic objectives, if any. In the absence of this last element, an initial outline is recommended that can provide a greater understanding of the organization, especially to elucidate the ideas and expectations for TD. As an illustrative sample of support materials, it is recommended to use strategic plan structures (artifacts), for example, that contain the definitions of vision, mission, values, SWOT analysis, and strategic objectives (SEBRAE, 2022).

Phase 1 - Step 2: Current Canvas and Chain

This stage aims to generate knowledge about the current business model as well as about the actors in the organization's value chain, expanding knowledge about the organization and its external context, about the mechanisms of value generation and the relationships between the components of the socio-technical system, which are the organization and its external environment. That is, more in-depth knowledge about each element of the business model and its environment must be generated. Extra-organizational (external actors, partners, suppliers) and intra-organizational (process management, value proposition) aspects should also be explained. In short, the internal production line (internal value chain) and the entire external value chain must be analyzed, mapping the main actors of the value-generating ecosystem, such as, for example, suppliers, development agents, service providers, technology suppliers and other actors in the innovation ecosystem in question. As support materials, it is recommended to use the *Business Model Canvas*. Another tool that facilitates the understanding of external elements can be the *Platform Opportunity* (Figure 3) (PLATFORM INNOVATION KIT, 2021), which has other canvases to facilitate the identification of the entire ecosystem involved.



Source: Platform Innovation Kit (2021).

As can be seen in figure 3, it is recommended to generate knowledge about elements of the environment external to the SME, such as the needs of partners (strategic alliances), their impact on society and the environment (natural resources used), how their value proposition relates to the other value propositions existing in the network of partners chain, and so on, always in the sense of rethinking the business model and its context, before choosing the technological solution.

Phase 1 - Stage 3: Customer Segments

This step focuses on emphasizing the importance of explaining the requirements of the customer segments, to understand what benefits are sought from the organization (personalization of the value proposition). From this initial stage, it is expected to guide the entire DT process in a customer-centric way, starting from an external perspective to carry out the internal transformation. Different classifications of customer requirements and studies in the marketing area can be used as support materials, such as: functional requirements (functionalities sought), economic (cost-benefit), logistical (ease of acquisition), emotional (experience offered) and social (social *status* obtained after acquisition) requirements (SCHALLMO; WILLIAMS, 2018).

Phase 1 - Stage 4: Diagnosis of the organization (level of scanning)

This step aims to carry out a diagnosis of the level of the organization in relation to DT. It seeks to estimate approximately the current level in relation to TD, so that it is possible to better know how to approach the project under development. Therefore, as an example of a tool to estimate the levels of digitalization, it is possible to use the Digital Quotient, from the *Care Framework* (ELANGO VAN; SESHADRI, SEETHARAMAN 2021), which classifies an organization's digital capabilities into:

- **Beginner:** basic digital capabilities, few new products, high cost of basic operations, and declining sales;
- **Optimizing:** digital capabilities optimize processes and the customer base is stable;
- **Accelerator:** digital capabilities improve the customer experience, products are improved, and there is revenue growth;
- **Disruptive:** Digital capabilities customize (personalize) and innovate products, the cost of operations is low, and future revenue projections are positive.

In addition, Chonsawat and Sopadang (2020) illustrate 23 SME-specific DT readiness indicators, which can serve as a complementary baseline. Here's a sample:

- Level of skill to deal with digital platforms;
- Percentage of customers reached via digital *marketing*;
- Level of cooperation with other partners in the SME network (e.g. number of partners, stages of the chain already integrated);
- Percentages of data collected, integrated, and analyzed in real time;
- Levels of knowledge possessed *versus* required to achieve each goal.

TD maturity models can also support this step. It is important to highlight that it is also recommended to raise the level of digitalization of partners (e.g., suppliers, service providers), as it may influence the TD result of the organization as a whole, as it tries to achieve interoperability between systems and logistics between partners in the chain (SCHALLMO; WILLIAMS, 2018).

PHASE 2: BUILD (INCREMENTALLY) THE TD STRATEGY

The goal of this phase is to build (incrementally) the TD strategy by improving the user experience and the new business model, suitable for TD. For this, the inputs generated in phase 1 (current strategy, current business model, analysis of the value generation ecosystem, customer segmentation, estimated level of TD), the functionalities of the technological enablers for DT (digital technologies) and recommendations of new practices for DT, to be made explicit, in order to think of new possibilities for the business model, are considered as a basis. as set out below.

Phase 2 - Stage 5: New DT Practices

This stage aims to identify new existing practices for DT, both in the scientific and business literature, that can have a positive impact on the business model (SCHALLMO; WILLIAMS, 2018). It raises what the SME needs to learn, to incorporate into its routines, after internally identifying the obsolete practices and routines to be discontinued (**organizational unlearning**) (NAVARRO; MOYA, 2005). The new practices raised in this stage serve as input for stage 7 (new Canvas). The specificities of each sector of activity of the organization in question, as well as its specific characteristics (SMEs), should also be considered.

According to Maire, Bronet and Pillet (2005), the term "best practices" or "good practices" can be associated with the choice of practices previously known and carried out by the organization itself, in order to make it more efficient. The term "new practices", on the other hand, is related to the possibility of externally identifying ways to more radically transform its key activities and value proposition.

For Schreier (2006), best practices are well known by a given community, with well-defined reference standards serving as a practical reference guide. However, new practices may already exist within the same community, usually being still poorly standardized and known, making the most well-known practices obsolete.

Practices may vary depending on the context of metamodel instantiation. There are generic practices, such as, for example, enhancing collective trust (organizational culture) (ELANGO VAN; SESHADRI; SEETHARAMAN, 2021) and create a *data-driven* culture (ARKAN, 2016), and more specific practices for SMEs in the industrial sector, for example, focusing on *lean manufacturing* and cyber-physical systems (SUFIAN *et al.*, 2021), use digital *marketplace platforms* (PLATFORM INNOVATION KIT, 2021) and cloud tools (LIU *et al.*, 2021), among others. Table 5 presents a recommendation of specific practices for SMEs, but which can be generalized to other organizations.

Table 5 – Sample of principles for TD in SMEs

Aspect	Principles	Authors
Initial Digitalization and Operational Optimization	Digitization and automation of key processes or parts of them is a prerequisite for initiating TD in organizations. This will allow routine tasks to be performed more efficiently and to generate data at the operational level, producing information about products, suppliers and customers for future analysis.	Legner <i>et al.</i> (2017); Erbert e Duarte (2018); Mahraz, Benabbou e Berrado (2019); Pelletie e Cloutier (2019); Levkovskiy <i>et al.</i> (2020); Pacheco, Santos e Wahrhaftig (2020); Sufian <i>et al.</i> (2021).
Security & Compliance	Develop a clear policy (transparency) for the use of individual/organizational data (e.g., customers and suppliers do not want their data shared with third parties or competitors, respectively). The protection of the collected data against cybercrime must be ensured to prevent leaks. Implement legal compliance (General Data Protection Law - LGPD). Seek technical standards and norms for the use of the data collected.	Choi and Sethi (2020); Legner <i>et al.</i> (2017); Erbert and Duarte (2018).

Business Intelligence	Extract information from the operational level to support decisions from the tactical/strategic level. Mine data to identify patterns and new demands. Gathering <i>insights</i> from the customer's experience with product/service. Seek personalization of the user experience (physical and digital).	Hoong (2013); Legner <i>et al.</i> (2017); Erbert e Duarte (2018); Göt'z e Jankowska (2018).
Cultural reframing: <i>data-driven</i>	Incorporate a culture of data-driven decisions to enhance the improvement or reinvention of products and services, as well as the business model as a whole. Seek digitalization and integration with other actors in the innovation ecosystem, the value chain (CHOI; SETHI, 2020).	Barann <i>et al.</i> (2019); Legner <i>et al.</i> (2017); Mahraz, Benabbou e Berrado (2019); Pelletie e Cloutier, (2019); Elangovan, Seshadri e Seetharaman (2021).
Cultural resignification: a culture that enhances innovation and engagement.	Complementing the previous item and seeking ambidexterity in addition to efficiency, creativity should be promoted through more flexible and friendly work environments (e.g., increased telecommuting, <i>happy hours</i>), which promote engagement and creativity. We should look for elements that enhance innovation, such as a culture of strong socialization and collective trust. Products and services must be co-created (PACHECO; SAINTS; WAHRHAFTIG, 2020) in an open innovation approach (CHESBROUGH (2017), through strategic alliances between SMEs (CEGARRA-NAVARRO, 2005).	E.g.: creating an emotional intelligence structure to enable organizational change (ELANGO VAN; SESHADRI; SEETHARAMAN, 2021).
Aspect	Principles	Authors
Focus on resources (SMEs) and Risk Management.	SMEs must carefully balance the resources spent on carrying out each action required for TD against their value creation proposition (LIU <i>et al.</i> , 2021). There is a risk of not obtaining the expected financial returns in time (Droi delay) (ERBERT; DUARTE, 2018). In addition, their scarcity of financial resources should lead them to seek the Risk Management area and the specific guidelines for SMEs (dependence on external financing, volatility in the prices of raw materials that hit them hardest, cyberattacks on local systems, dependence on the chain with few suppliers, growth risk and consequent increase in costs) (FALKNER; HIEBL, 2015).	Liu <i>et al.</i> (2021). Falkner and Hiebl (2015).
Cloud-first (PMEs)	Due to the lack of IT infrastructure and technological expertise, one possibility for SMBs is to pursue a cloud approach. Benefits: high reliability, availability, scalability and relatively low cost. Cloud computing and storage services can be subscribed to on a monthly basis, for example, and scaled according to needs, eliminating the costs of maintaining <i>hardware</i> and <i>software</i> infrastructure. However, there may be divergences between the requirements of the SMB and the services offered by the cloud provider. The following challenges stand out: dependence on internet connection (continuity of services), privacy and security (company data is stored by another) (QIAN <i>et al.</i> , 2009), external technical dependency, and the problem of vendor lock-in , which means that if the SMB wishes to change cloud service providers, this task has proven to be extremely difficult (time and cost), due to the lack of compatibility between the different solutions of different cloud providers, proprietary architectures, lack of open standards and interoperability, and proprietary <i>software</i> licenses used (OPARA-MARTINS; SAHAND; TIAN, 2014).	Liu <i>et al.</i> (2021). Pelletie e Cloutier (2019). Quian <i>et al.</i> , (2009). Opara-Martins, Sahandi e Tian (2014).
Social media	Consider the flow of C2B communication (from the customer to the organization). Social networks are an opportunity to mine <i>insights</i> from customers, as they create a new meaning in the communication process between consumers and companies, which can be beneficial. However, online viral reviews (eWOM) can cause serious reputational damage to businesses.	Göt'z e Jankowska (2018).
Emerging Technologies and Agile Methods	Continuously monitor emerging technologies, review the business model in light of this evolution and act in an agile manner. Rapid prototyping can facilitate constant improvement of the product or service through local testing and <i>user feedback</i> .	Erbert and Duarte (2018).
Aspect	Principles	Authors

<p>Focus on the customer (<i>Customer-Centric</i>)</p>	<p>Orient the DT process with the customer as the protagonist, rethinking three elements: the transformation of customer experiences, the transformation of business processes and the reinvention of business models. The transformation of the customer experience must take into account the ability of digital technologies to collect <i>feedback</i> and personalize the product/service (PACHECO; SAINTS; WAHRHAFTIG, 2020), as well as the high demand of the new generations, who are increasingly digitized (digital natives) (MAHRAZ; BENABBOU; BERRADO, 2019).</p>	<p>"Customers are more demanding and expect companies to listen, understand and be flexible about their evolving needs." Mahraz, Benabbou and Berrado (2019).</p>
<p>Model Based on Digital Platforms</p>	<p>Consider the advantages of insertion in digital platforms or <i>marketplaces</i>. According to Pacheco, Santos, and Wahrhaftig, (2020, p. 98), business models based on digital platforms have generated phenomena such as dematerialization (i.e., exchange of acquisition for the use of goods) and disintermediation (i.e., reduction of intermediaries between products and beneficiaries). Although they have a more evident impact on the services sector (e.g., Uber, Airbnb), they have multisectoral potential.</p>	<p><i>Marketplaces</i> are being used to digitally transform entire industries and develop new sources of competitive advantage through the convergence of cloud, <i>big data</i>, <i>mobile</i>, and integrated partner networks (IDC, 2013). E.g. personalized advertisements, recommendation systems, better delivery logistics.</p>

Source: prepared by the author.

For Maire, Bronet and Pillet (2005), among the approaches that can help a company improve its performance, *benchmarking* is one of the most used, as it can serve as an approach to obtaining and sharing knowledge, by analyzing the best practices in an industry and evolving them internally.

Also at this stage, it is highlighted that, in addition to learning new practices, it is necessary to consider the disposal of old ones. According to Navarro and Moya (2005), ineffective and obsolete organizational knowledge and routines block the absorption of new knowledge and opportunities. This is because, in general, when looking for KM processes, organizations focus on increasing their organizational learning, but not on the process of organizational unlearning (NAVARRO; MOYA, 2005; TSANG, 2008). Thus, organizational unlearning can be understood as a process in which outdated knowledge and routines are abandoned, with the aim of facilitating the absorption and development of better and new practices and cultures (NAVARRO; MOYA, 2005; ZHAO, 2013).

Phase 2 - Stage 6: Technology Enablers

This stage complements the previous one, as it aims to identify the technological enablers (digital technologies) of TD that can transform the business model. In the same logic as in the previous step, when instantiating this meta-model, a search for case studies, reports of technological trends and benchmarking should be carried out that can help to create an overview of the main technologies and compare them to the current business model (SCHALLMO; WILLIAMS, 2018). As supporting materials, examples can be seen in Erbert and Duarte (2018) or Sufian *et al.* (2021), which recommend and detail the possibilities of using current technologies for industry 4.0, such as:

machine learning (artificial intelligence) and *big data*, cyber-physical systems, internet (and industrial) of things, cloud and virtual reality. The idea of this step is to select a sample of possible technologies, and evaluate how they impact the organization's business model. For example, Artificial Intelligence (AI) is a variety of intelligent human behaviors, such as perception, memory, judgment, reasoning, communication, learning, forgetting, creating, and so on, that can be artificially performed by machines (LI; DU, 2017). Therefore, it is necessary to raise the impacts of AI considering the organization's current business model, as well as its value chain.

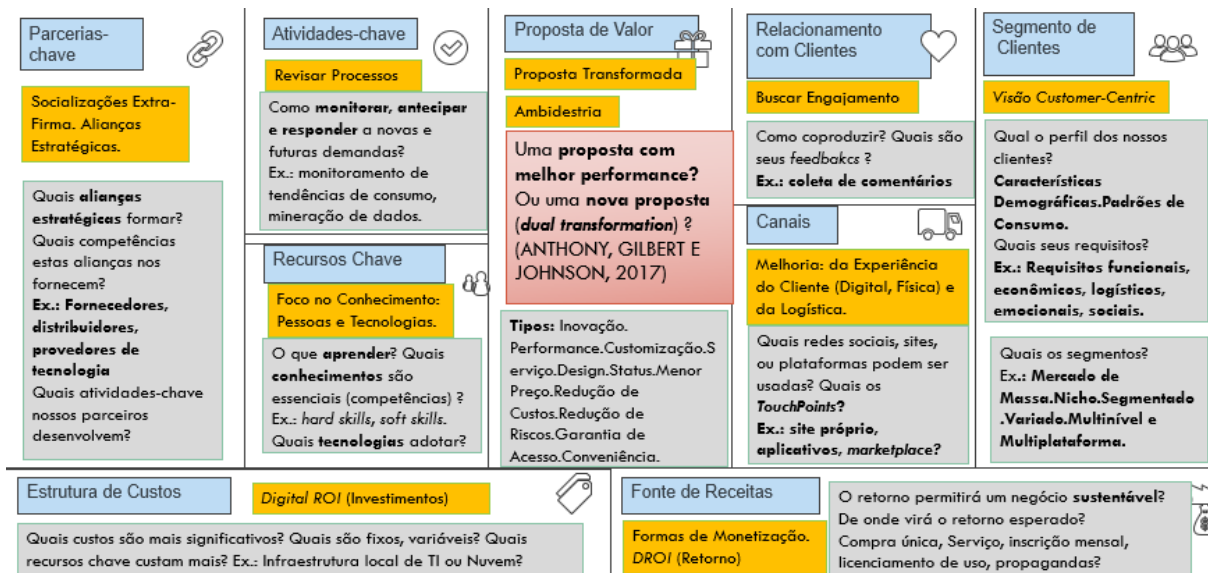
Phase 2 - Stage 7: New Canvas (MN)

This step aims to build a Canvas for TD (MN – business model), which reconfigures the organization's resources and key activities, to seek RO (organizational resilience), through a continuous flow of anticipation, monitoring, response and learning. It is recommended to consider the potential of the new practices and technologies raised in the previous stages, in such a way that the organization transforms its paths of value creation while managing structural changes and organizational barriers due to the impact of the latest digital technologies (VIAL, 2019).

It is recommended to monitor the environment external to the organization, that is, variables such as new customer behaviors, emerging digital technologies, and new best practices for DT, already raised above. Other variables can be added, such as new trade regulations (state) and market trends. Still in the external environment, especially for SMEs, due to their greater need to form alliances, partners should be monitored, in order to seek key partnerships (strategic alliances) to assist in internal knowledge gaps and form integrated logistics for the delivery of the value proposition (e.g., suppliers and delivery logistics).

Next, one must learn (internalize) the data and information collected about the external environment, transforming elements of the business model, such as processes (key activities), people (training, competencies), cost structures (e.g., considering training costs), and environment (e.g., customer-centric culture). These transformations will enhance an anticipation of significant changes in the external environment and will allow the organization's response, in the form of a new value proposition appropriate to DT, through new, more efficient and personalized delivery channels (effectiveness).

As a support tool, it is recommended to instantiate the *Business Model Canvas* for TD (Figure 6):



Thus, the purpose of this stage is to use all the knowledge raised in the previous stages about the value chain and its actors, about the requirements of the customer segments, the strategies and the business model of the organization, about the key concepts related to DT, its digital enablers (technologies) and the recommended principles, in order to then adapt the business model to this new reality. In particular, the functionalities and features of digital enablers and DT principles can be used to simulate new business model options (SCHALLMO; WILLIAMS, 2018, p. 53), allowing performance improvement for the implementation of the value proposition or the creation of an entirely new proposal (ANTHONY; GILBERT; JOHNSON, 2017). For example, implementing self-service via *chatbot* on WhatsApp, inserting yourself in *marketplace* platforms, investing in augmented reality, among others.

As a complement to the support materials for this stage, we also recommend the RAD Model (*Run, Accelerate, Disrupt*), *Paths* (ELANGO VAN, SESHADRI and SEETHARAMAN, 2021) and the characteristics of digital business models (SCHALLMO and WILLIAMS, 2018).

Phase 2 - Step 8: TD Response Strategy

This stage aims to develop specific strategic objectives for TD based on the new *Business Model Canvas*. Specific strategic objectives for TD should be made explicit, detailing the expected results. As seen above, one can separately or simultaneously (*dual transformation*) design business models that use digital technologies for two purposes: to improve the organization's performance (for a short-term response) or to create entirely new products and services, estimating long-term results. In other words, it is recommended at this stage to look for organizational ambidexterity as a culture to be sought. This concept rescues the importance of the balance between operational efficiency, through rigid and efficient processes; and creativity, through a flexible and exploratory culture (in the

sense of research and development, experimentation), which allows for the discovery of new knowledge and innovation (O'REILLY; TUSHMAN, 2008).

As support material, the agile OKR (*Objectives and Key Results*) method is recommended, aimed at promoting quick adaptations to constant changes, in shorter time intervals (CASTRO; MONTGOMERY; KARRER, 2018). The perspectives of the bsc (*balanced socred cards*) can also help to think about kpis (*key performance indicators*) for TD (Chart 3) (STALMACHOVA, CHINORACKY and STRENTITZEROVA, 2018).

Chart 3 – Examples of strategic objectives for TD planning

Organizational Perspective	Strategic Objective (TD)	Measure
Financial Perspective	Reduce operating costs by utilizing technological advancements.	Share of ICT costs in total costs. Return on investment in ICTs.
	Increase revenue by offering new digital products and services.	Share of revenues from digital products and services in relation to total revenues.
Consumer/user perspective	Improve the availability of user service (cross-platform).	Number of mobile app downloads. Number of authentication <i>tokens</i> generated. Customer satisfaction with the mobile app. API response time.
	Attract new customers.	Rate (percentage) of attracting new customers through the use of ICTs. Customer satisfaction with new products and services.
	Retere existing customers.	Retention rate of existing customers.
	Improve the organization's interaction with the customer.	Customer satisfaction with service levels. Usability metrics, customer effort score (e.g., <i>Customer Effort Score</i>).
	Increase user engagement.	Engagement metrics (social media interactions, likes, shares, comments).
Organizational Perspective	Strategic Objective (TD)	Measure
Process Perspective	Digitize and Optimize processes.	Increase in the percentage of digitized processes. Total number of artifacts (e.g., official documents) articulated in digital format. Processes replaced by more efficient ones, using digital technologies.
	Improve the safety of processes and activities.	Number of attacks fried/blocked. Number of fraudulent transactions that occurred. Number of occurrence of leaked data.
	Introduce new digitized products and services.	Number of new digitized products and services introduced per year. New time to launch the product/service to the target audience.
Learning Perspective.	Provide continuing education to employees (face-to-face or remote).	Number of trainings completed per employee per year. Investment in employee training per year.
	Improve Employee Productivity.	Percentage of profit sharing. Bonus for solved tasks. Greater incentive for more complex, higher-impact tasks. Encouragement for sharing technical knowledge.
	Modernization of ICTs.	Increased investment in more modern ICT equipment.
	Increase employees' digital skills (e.g. digital literacy, new	Level of digital skills of employees. Complementarity between digital and non-

	programming languages).	digital skills (e.g., training in <i>hard</i> and <i>soft skills</i>).
	Create a digital culture and flexible work environment.	Level of employee satisfaction with ICTs used at work. Employee satisfaction with working hours and work shifts. Rate of use of modern communication tools (e.g. Slack, MS Teams, Google Meeting). Use of flexible ways of working (teleworking, reduction of hours). Degree of self-control and ability of employees to self-organize.

Source: adapted and translated from Stalmachova, Chinoracky and Strenitzerova (2018).

It is noteworthy that, when developing the strategic plan for DT in SMEs, it is necessary to consider its specificities, such as scarcity of resources and knowledge gaps (KLEIN; TODESCO, 2020).

PHASE 3: DESIGNING THE TD

The goal of this phase is to design the transformation based on the strategic objectives elaborated, and the new *Business Model Canvas* for TD.

In this phase, the optionality of each stage stands out, since each organization arrives at this stage with a different level of TD and strategic objectives.

For example, for TD projects aiming to pursue rapid digitalization, one can stick to a simpler digitization project, and engage the people needed to implement it. Now, for projects with larger objectives, it is recommended to also instantiate the "KM (Knowledge Management) Project" stage, to create a de facto ambidextrous culture, which seeks to generate innovation based on organizational knowledge.

Phase 3 - Stage 9: Knowledge Management (KM) Project

Organizational knowledge is an intangible asset that can be managed, and is essential to respond appropriately to changes in the business environment (SELL; FREIRE; TODESCO, 2020). Therefore, this stage aims to structure a KM program in order to create processes that allow the maintenance and expansion of competitive advantage. Therefore, KM processes must be implemented with a view to identifying, creating, storing, sharing and applying (accessing) knowledge in the different areas of the organization. For example, knowledge gaps should be mapped (e.g., training in the necessary technologies); preserve and minimize knowledge loss (e.g., key employees leaving); create elements that enhance innovation (flexible culture, *home office*); among other KM recommendations. As a support material, the *APO* (ASIAN PRODUCTIVITY

ORGANIZATION) *KM framework is recommended*. It indicates processes, methods, techniques, and tools for each of the five steps of its KM model (APO, 2020).

Phase 3 - Step 10: People Engagement

This stage aims to prepare the organization to understand the internal changes (cultural resignification) that enhance the implementation of DT. According to Burchardt and Maisch (2019, p. 113), in order to achieve the necessary engagement for DT, a cultural resignification must be sought in the organization. Organizations need to have a high degree of predisposition to change, great flexibility and self-management capacity of their employees, to respond to highly volatile and competitive environments, such as the labor market. In this regard, it is emphasized to seek continuous improvements in the *customer experience* and *employee experience*. According to Jain, Aagja and Bagdare (2017), CX has emerged in recent decades as an important *marketing* concept, being defined as a unique, pleasurable and memorable experience, the result of a strategic process to create value through differentiation and competitive advantage of products/services. On the other hand, employee engagement (*Employee Engagement – EE*), in addition to reducing turnover (and loss of tacit knowledge), increases the possibility of contributing ideas to innovation or improving process performance, which are important for competitive differential, as it is people who create such differential, since the same technology may be available to other organizations (CHANDANI *et al.*, 2016).

Teichert (2019, p. 1682) describes attributes that characterize an organizational culture focused on DT, using the term "digital culture", such as an organizational environment tolerant to failures, incorporation of new work methods, with leadership transparency, decentralized decision-making, and a focus on continuous improvement of the user experience, among others.

Phase 3 - Stage 11: Scans Program

This step recommends projecting an incremental advance in the use of digital technologies, from the operational to the strategic level, and among the actors in the supply chain, thus promoting the implementation of a culture of data-driven decisions. Therefore, an alignment between the strategic objectives, functionalities and characteristics offered by the different digital technologies should be sought, and the different levels of digitalization among the actors in the chain should be considered. It also involves identifying any knowledge gaps to deal with the technologies to be deployed, and developing a plan of competencies required. As support material, the following steps are recommended, based on Sufian *et al.* (2021) and Verhoef *et al.* (2021): 1 - basic connectivity (initial IT infrastructure); 2 - Information Systems for Vertical Integration (intra-organizational, between operational, tactical and strategic levels); 3 - Information Systems for Horizontal Integration

(extra-organizational, where partner systems, data from social networks and other possible external sources are integrated); 4 - Analytical Capacity (develop the competence to mine data to generate *insights*); 5 - Experimentation with emerging technologies (exploring new possibilities offered by new digital technologies).

Phase 3 – Stage 12: Learning and Adaptation (Organizational Resilience)

This last step aims to design a process of continuous improvement of the use of digital technologies in the organization. Thus, it aims to implement mechanisms for monitoring and adapting DT strategies, as well as learning about the deployment of the strategy, in order to ensure the adaptation of the organization to the new context.

According to Rosing and Etzel (2020), DT is a process whose life cycle needs to contain a phase of continuous improvement, to constantly meet new demands and possible new technological advances and different ways of using digital technologies. Such an approach should focus on innovation management, whose process needs to be continuous and integrated with other organizational processes, promoting the creativity of professionals, stimulating socialization and obtaining extra-firm knowledge (OLIVEIRA; OLIVE TREE; ZIVIANI, 2019).

As support material for the implementation of the post-TD continuous improvement phase, the guidelines for RO (organizational resilience) applied to TD are recommended, as follows:

- **Constantly monitor** critical changes in the internal and external environment. E.g., measuring the organization's performance indicators; monitor market demands, technological trends, digital technologies used by competitors;
- **Learn** the knowledge needed to deal with changes in the environment. E.g., develop the ability to understand customer segments based on their data, understand new demographics and their behaviors. Incorporate managerial and technological competencies inherent to the data-driven decision-making process: collecting, treating, analyzing, estimating consumption patterns and trends. E.g.: based on the use of the latest products, better estimate production quantities, avoiding waste and losses;
- **Anticipate** or prepare in advance for potential changes. Facilitate future response. E.g.: based on learning about the customer segment and constant monitoring of their demands, estimate new products/services that can be reinvented into totally new parts or products, starting as soon as possible the training with employees in the necessary technologies;
- **Respond** to changes in the medium. Actually implement the necessary adaptations, reacting to new demands. E.g.: optimization of processes and logistics, continuous improvement of products and services.

In addition to the continuous improvement based on the RO explained above, this step also recommends guidelines pointed out by other authors in studies on DT in society that may be important for maintaining long-term competitive advantage for organizations. As can be seen in the term 'Industry 5.0', as defined in the report for the future direction of European industry (EUROPEAN COMMISSION, 2021), 'Industry 5.0' is a complement to the existing 'Industry 4.0' approach, specifically putting research and innovation at the service of the transition to a sustainable, human-centred and resilient industry. For Deguchi *et al.* (2020), DT can be thought of as not only generating data for analysis and decision-making, but also serving the implementation of values that seek the difficult balance between individual and collective benefits, in the constant challenge of improving the quality of life, making use of technologies.

In addition to these recommendations, it is highlighted that DT is an opportunity to bring to light the environmental and social concerns inherent to the surroundings of the organizations in question. The triple ESG (*Environmental, Social and Governance*) indicators has gained attention in the industrial environment and in academic research (BASSEN; KOVÁCS, 2020; UMAR; KENOURGIES; PAPATHANASIOU, 2020), as it is a way to attract investments to organizations, and which can be desired by SMEs. The incorporation of the ESG concept implies the creation of data with relevant information about a company's performance in non-financial values (environment, social responsibility and governance), offering inputs to investors, who can thus better assess investment risks. As an example that can make investors aware of the risk that the absence of environmental concerns can cause, the literature in the area mentions the scarcity of raw material for manufacturing industries as a possibility of investment losses (BASSEN; KOVÁCS, 2020), just to illustrate one case among many.

CONCLUSIONS

The proposed meta-model is based on several notes in the academic literature and technical reports, which indicated the need for a strong strategic orientation to implement the DT process in any organization, as a step prior to mere technological adoption. Thus, in order to effectively pursue DT, the artifact proposed to support the transformation of different organizational elements, based on the triple processes, people (organizational culture) and technologies. In other words, DT was understood as a non-trivial process, which requires an interdisciplinary look for its better understanding. Through organizational ambidexterity, we seek to increase the resilience of organizations in the face of DT, which is a strong change in their external environment. Thus, with knowledge as a key element, the proposed meta-model helps to create strategies based on obtaining and applying the necessary knowledge to carry out the internal DT of organizations. With a focus on SMEs, it was possible to idealize a scenario of greater difficulty to implement DT, due to the scarcity



of resources, lack of strategic vision and managerial and technological knowledge. However, such adversities can be overcome with the recommendations of the proposed artifact, which is its main contribution. In the short term, the meta-model can serve for rapid digitalization, given the need for adaptation and response of each organization, recommending a strategic review and search for a digitalization project, for example. In the long term, its contribution is to monitor and promote a continuous improvement of the organization, focusing on a strategy based on the management of the knowledge necessary for better use of digital technologies, redefining the organizational culture, engaging people and generating positive implications both for the organization and for its surroundings, society and the environment.


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Description of the Bolsa Família-Habitação relationship based on the national household sampling survey - Continuous for the 1st visit of the year 2022^x

 <https://doi.org/10.56238/sevned2024.014-004>

Jorge Alves de Sousa¹ and Verônica Dantas dos Santos²

ABSTRACT

This article describes, through a statistical analysis, the relationship between the Federal Government's Bolsa Família (BF) Program and the housing situation of those contemplated in the Program, based on the Continuous National Household Sample Survey - Continuous PNAD, 1st Visit for the year 2022. For this analysis, the microdata collected based on the questionnaire used in the research were consulted, as well as technical notes made available by the Brazilian Institute of Geography and Statistics (IBGE). Because it is a reliable source for obtaining statistical information on the demographic, social, economic and housing characteristics of the Brazilian population, and using quantitative methodology, the data were analyzed using the R software and the survey package. The results obtained through this statistical analysis showed that there is a significant number of low-income people who own their own homes; the value of the rent is extremely expensive, in most of the FUs, especially in the South, Southeast and Midwest regions of the country, which compromise more than 100% of the amount received by the BF. We can see that BF has a relationship with housing, considering that the amount received by the beneficiaries minimizes housing inequality, since this value helps families with essential costs for survival. In this sense, more studies are needed to help in the understanding of the conditions in which these dwellings are found, in order to promote and improve public policies aimed at housing in order to improve the living conditions of the low-income population.

Keywords: Low income, Survival, Housing inequality.

¹ Doctor in Agricultural Engineering, Federal University of Campina Grande

² Graduated in Mathematics, Federal University of Campina Grande



INTRODUCTION

Statistics has become the universal language of the sciences and in data analysis one can lead to powerful results. As scientists, researchers, and managers working in a wide range of industries, we all rely on statistical analysis to help us answer the questions that arise in populations, such as those raised in our work. It is not difficult to find, in a brief search on the internet, institutions around the world that have used this part of the methodology of Science to make estimates in the population based on samples. The U.S. Census Bureau, or United States Census Bureau, is part of the United States Department of Commerce. It is a government agency responsible for carrying out population and economic research in the United States, in the United Kingdom it has the National Institute of Statistics (ONS) and in Brazil we have the Brazilian Institute of Geography and Statistics (IBGE) which fulfills the mission of identifying and analyzing the territory, counts the population, shows how the economy evolves through the work and production of people, It also reveals how they live, in many of these cases, using sampling technology. In this context, the IBGE (2023) has carried out the Continuous National Household Sample Survey - Continuous PNAD, which aims to monitor the quarterly fluctuations and the evolution, in the short, medium and long term, of the workforce, and other information necessary for the study of the country's socioeconomic development. To meet these objectives, the survey was planned to produce quarterly indicators on the labour force and annual indicators on permanent supplementary topics (such as work and other forms of work, care of people and household chores, information and communication technology, etc.).

Housing is an environment whose main function is to be habitable (Cohen et al., Col., 2004). As human beings, it is essential that we can enjoy a space that offers us shelter, security and comfort, in order to achieve a dignified life. According to the latest census of 2022, it highlights that in Brazil we have about 67.8 million people living in poverty and 12.7 million in extreme poverty, this expressive number reflects an alarming reality of people who face unhealthy conditions, such as the lack of food, health, housing and other essential resources for a decent life. Bolsa Família (BF) is a minimum income program whose objective is to minimize poverty by providing families with financial resources that allow them to achieve autonomy and overcome the difficulties arising from the scarcity of financial resources. In this way, families can stay in the program until they are able to secure their own livelihood and financial independence. The benefit is paid by the federal government through cash (not cash) transfers, usually to families. A small percentage of individuals living alone may be eligible as long as they meet the prerequisites required by the program. According to Souza (2019), it was and is an important factor in reducing inequality in the country. To point out some relationships between BF and housing, focusing on the BF beneficiary population of all Federative Units (FUs). This scenario can be characterized as ideal for us to make use of the tools of Statistics from the sampling process to the inference of totals, averages, among other measures,



since we have a significant elevation sample represented by the PNADc. Bussab and Morettin (2023) report that this Statistics is the part of the science methodology that aims to collect, reduce, analyze, and model data, from which, finally, the inference is made for a population from which the data (the sample) were obtained.

GENERAL OBJECTIVE

In view of the above, the objective of this study was to descriptively evaluate how the beneficiaries of the Bolsa Program live in relation to basic housing conditions, based on PNADC microdata.

SPECIFIC OBJECTIVES

Characterize how the people contemplated in the Bolsa Família program live, for the most part, in terms of housing conditions (owned or rented) and destination of sewage;

Measure how much the people contemplated in the Bolsa Família program receive in aid, how much is paid in rent and how much is spent on rent of the amount received;

To compare which FUs differ from the others in the spectrum of the main variables analyzed.

MATERIAL AND METHOD

In this work, we used the database made available by the IBGE in the "microdata" section, specifically the data from the 2022 Continuous PNAD referring to the first visit, to analyze aspects of housing in relation to the BF beneficiary population, covering all FUs, i.e., Acre, Alagoas, Amapá, Amazonas, Bahia, Ceará, Distrito Federal, Espírito Santo, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraíba, Paraná, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Rondônia, Roraima, Santa Catarina, São Paulo, Sergipe, Tocantins. We carried out an analysis that makes it possible to point out a relationship between BF and housing, addressing the profile of the sample and some characteristics of the housing. Throughout the study, we highlighted the regions that presented the most significant results, which allowed us to discuss their particularities and specific challenges of the housing of people in low-income situations.

To obtain this sample, the IBGE employs a sampling plan that incorporates probabilistic sampling techniques and models (IBGE, 2014). These techniques are used in the selection of households in order to ensure an adequate representation of a portion of the households in each state (sample) in relation to the total number of households in these states (population).

During the first visit, a questionnaire is applied that covers some topics, including information about the residents (age, gender, education, occupation, income, etc.), characteristics of the dwelling (type of household, construction material, water supply); health; work and income and



food security. We will focus on the housing topic, which is part of the Housing Module of the Continuous PNAD during the first visit of 2022. For this, we will also consider the characteristics of the residents. To prepare our research, we will use the questionnaire, which contains answers collected about housing, income obtained from BF and general characteristics. We decided to select questions and consider them as nominal qualitative and discrete quantitative variables.

Nominal qualitative variables include "Region of origin", "Sex" and "Color or race", while the discrete quantitative variable is "Age". These variables will help us profile our sample in relation to these aspects. To delve deeper into housing, we used the following nominal qualitative variables such as "Household situation" (which can be owned, rented or other type) and "Sewage destination" (which includes categories such as general network/rainwater network, septic tank connected to the network, septic tank not connected to the network, rudimentary tank, ditch, river, lake or sea). In addition, we have continuous quantitative variables, such as "Amount Received", "Amount of Rent Paid", and "Amount Committed to Rent in Relation to Amount Received". These variables will help us to better understand the profile of the sample in relation to housing and its relationship with socioeconomic aspects, contributing to a more comprehensive analysis of this relationship between BF and housing.

We decided to use the R software along with the package *Survey* because this is considered a complex sample, due to its sampling plan and the high volume of data that make up this sample (376,821). This choice allowed us to perform statistical calculations, including mean, standard deviation and estimates for the population based on the available sample, providing an analysis of the gap between BF and housing.

RESULTS AND DISCUSSIONS

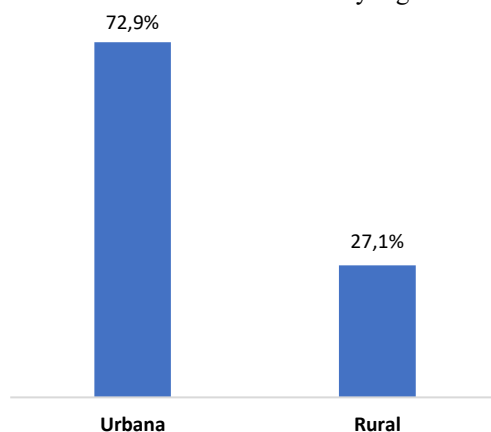
SAMPLE PROFILE

Our sample is derived from data obtained by the IBGE for the 2022 Continuous PNAD. It is important to note that this collection is carried out throughout the Brazilian territory, with the exception of indigenous villages, barracks, military bases, lodgings, camps, boats, boats, ships, penitentiaries, penal colonies, prisons, jails, asylums, orphanages, convents, hospitals and agrovillages of rural settlement projects, as well as census tracts located in Indigenous Lands. Briefly, we will describe the statistical criteria and the sample selection process that the IBGE takes into account at the time of the process of choosing the representative sample, for which two stages responsible for the choice of the sample are highlighted. Before the presentation of the stages, we will show how the Primary Sampling Units (PSUs) are defined. The determination of the number of PSUs per region is given by the size of the census tracts and each PSU must have at least 60 permanent private households (DPPs) that include occupied households, occupied households



without interviews and vacant households. If a census tract has 60 or more DPPs, it constitutes a UPA, if the tracts of a region do not reach this minimum value, they are grouped with other tracts of the same situation, as long as they belong to the same subdistrict and respect the type of household, in order to reach the 60 households necessary and form a UPA.

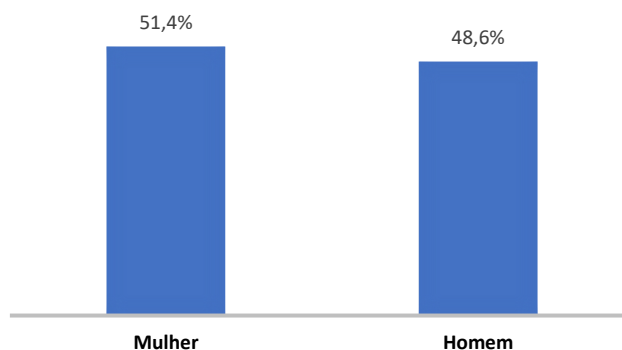
Figure 01: Distribution of households by region: Urban and Rural



Source: IBGE/PNADC (2022)

Note: Prepared by the author himself based on IBGE data.

Figure 02: Distribution of men and women interviewed

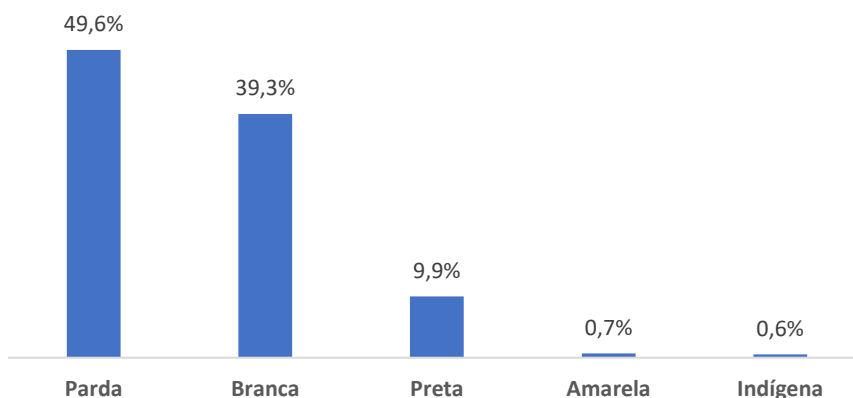


Source: IBGE/PNADC (2022)

Note: Prepared by the author himself based on IBGE data.



Figure 03 - Percentage of the sample by color or race



Source: IBGE/PNADC (2022)

Note: Prepared by the author himself based on IBGE data.

After the formation of the UPAs, the first stage begins, in which PSUs are selected with probability proportional to the number of households within each defined stratum. A stratification defined by the SIPD is used, the selection of the UPAs is made from the Master Registry, which contains information for each UPA on administrative dependence and some sociodemographic characteristics. The PSUs that make up the Continuous PNAD sample are selected to compose the Master Sample of a quarter. In the second stage, the previously selected UPAs are used, and from each of them, 14 occupied permanent private households are selected. The selection of these households is made by means of simple random sampling, using the National Registry of Addresses for Statistical Purposes (CNEFE). To obtain more detailed information about the sampling process, the Sampling Plan is available in the technical notes released by the IBGE.

Table 1 - Sample distribution by Federation Unit

Federation Unit	Sample	Percentage	Federation Unit	Sample	Percentage
Rondônia	6323	1,7	Sergipe	7105	1,9
Acre	7359	2,0	Bahia	18510	4,9
Amazonas	11072	2,9	Minas Gerais	28139	7,5
Roraima	4490	1,2	Espírito Santo	13445	3,6
Pará	13952	3,7	Rio de Janeiro	25591	6,8
Amapá	3210	0,9	São Paulo	29216	7,8
Tocantins	5574	1,5	Paraná	20541	5,5
Maranhão	24796	6,6	Santa Catarina	23901	6,3
Piauí	8958	2,4	Rio Grande do Sul	19707	5,2
Ceará	18091	4,8	Mato Grosso do Sul	8149	2,2
Rio Grande do Norte	7681	2,0	Mato Grosso	9852	2,6
Paraíba	10325	2,7	Goiás	12812	3,4
Pernambuco	15438	4,1	Distrito Federal	6797	1,8
Alagoas	15787	4,2			
Total	-	-	-	376821	100

Source: IBGE/PNAD (2022)

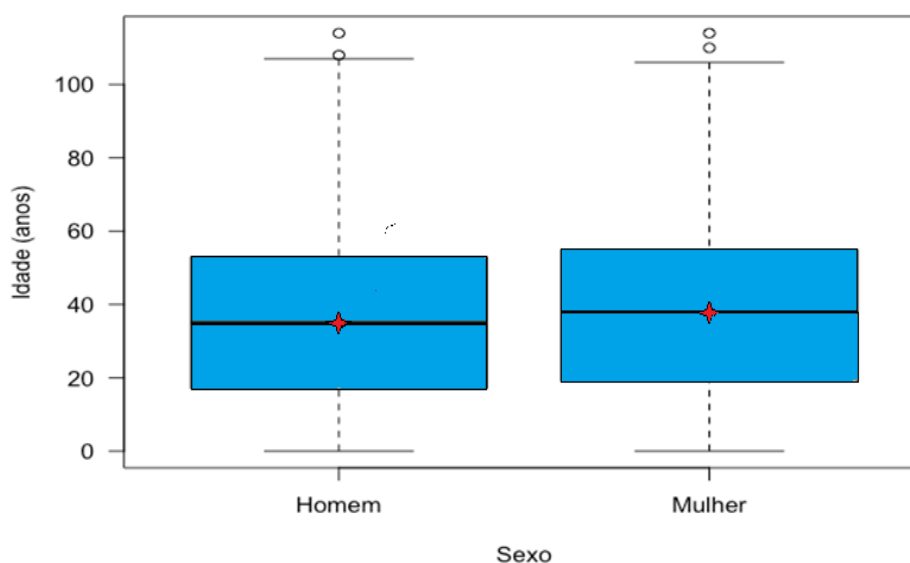
Note: Prepared by the author himself based on IBGE data.

Communication and Culture: Multidisciplinary Perspectives

Table 1 shows the sample distribution by state, including absolute and relative frequencies, in relation to a sample universe of 376,821 households. It should be noted that the states with the highest volume of households are concentrated in the Southeast region: São Paulo (7.8%), Minas Gerais (7.5%) and Rio de Janeiro (6.8%). This predominance reflects the high population density in this region. On the other hand, the states with the lowest number of households are Amapá (0.9%), Roraima (1.2%) and Rondônia (1.7%), located in the northern region of the country, characterized by having smaller populations compared to other Brazilian regions.

Among these households interviewed, 2.9% are located in urban areas, while 27.1% are in rural areas, as shown in Figure 01. Regarding the gender of the interviewees, 51.4% were women and 48.6% were men, as shown in Figure 02. Figure 03 shows the distribution of the race or color of the interviewees, highlighting that 49.6% were brown, followed by 39.3% of white people, 9.9% of black people, a small proportion of 0.7% of yellow people and 0.6% of indigenous people.

Figure 04- Comparative Boxplot: Gender x Age



Source: IBGE/PNADC-2022

Note: Prepared by the author himself based on IBGE data.

For a clear representation of the age distribution of the interviewees in our survey, we chose to use the boxplot plot, as shown in Figure 04. This graph provides a visualization that highlights the distribution of ages, allowing us to identify where the ages of the men and women in this sample are concentrated by means of the median, quartiles, and extreme values, also known as outliers.

Looking at the data, we found that 51.4% of the interviewees are women. Among them, 75% are under the age of 58, while the other 25% are dispersed above this age group. In addition, it is noteworthy to observe the presence of two values that differ from the others above the upper limit,



indicating two women over 100 years of age. Regarding men, half of them are between 18 and 35 years old. It is observed that 75% of men are under the age of 55, while the other 25% are over this age group. A marked dispersion is also noticeable, with the presence of outliers above the upper limit, indicating males over 100 years of age. After observing this gender distribution, we noticed that the women interviewed tended to be slightly older on average than the men interviewed.

HOUSING AND INCOME

Regarding the question "Is this household?" of the households in FUs where BF is received, about 88.9% of these FUs have half of their households as the property of the beneficiaries of the program, in Table 2 we also note that the states with the highest number of households are Amapá (83.7%), Amazonas (83.1%), Maranhão (80.7%), Piauí (78.8%), Pará (77.5%), Acre (77.4%) and Bahia (75.6%). The states with a percentage lower than 50% were the Federal District (29.8%), Goiás (46.4%) and Santa Catarina (48.8%). Those who answered that they lived on rent stood out in the Federal District (53.4%), Santa Catarina (41.7%), Minas Gerais (32.8), Goiás (32.6%), São Paulo (30.5%) and Paraná (30.3%) and with the lowest percentage we had Amapá (6.8%), Amazonas (9.7%), Maranhão (10.5%), Piauí (10.2%) and Pará (12.0%). As for those who were neither living in their own nor rented residence, the "Others" option included individuals who lived in assigned households, either by the employer, by relatives or by any other person other than the legal resident of the household. This also covers cases of invasion, in which the resident had no right to be in that household. For this category, the states with the highest percentages were Rondônia (21.2%), Goiás (21.0%), Espírito Santo (19.6%) and Mato Grosso do Sul (19.2%). On the other hand, the states with the lowest proportions were Amapá (7.2%), Maranhão (8.8%), Acre (9.5%) and Santa Catarina (9.6%).

According to the newspaper G1 (2022) released a study carried out by the startup QuintoAndar in collaboration with Datafolha, revealing that the majority of the Brazilian population lives in their own home, that is, seven out of ten Brazilians own their own home. It is important to note that these results are not specific to BF beneficiaries. Although these numbers represent a general estimate, it is noticeable that our sample closely reflects these percentages, in terms of the high number of households being owned. It is crucial to point out that owning a home does not automatically guarantee adequate housing conditions, and many people may face problems related to precarious housing or a lack of essential resources to create a favorable and quality housing environment. As for the type of household, the IBGE reported in the last census of 2022 that eight out of ten people lived in houses, that is, the majority of our Brazilian population lives in houses.

We highlight that, although the percentage of those contemplated by the BF program is significantly higher when we compare the condition of owned housing with rented housing, these



dwelling most of the time do not offer minimum quality standards. To test this fact, we were able to observe in the database analyzed through the item "sewage destination" that makes up basic sanitation, which FUs have the following destinations: General network/rainwater network, septic tank connected to the network, septic tank not connected to the network, rudimentary tank, river ditch, lake or sea, and the most appropriate sewage destination is general network/rainwater network, mains-connected septic tank and others.

Table 2. Distribution of the estimated proportion of the population by housing situation covered by the Bolsa Família by Federation Unit

UF	Housing			Total
	Own	Rental	Other	
Acre	77,4%	13,4%	9,2%	100,0%
Alagoas	66,2%	20,3%	13,5%	100,0%
Amapá	83,7%	6,8%	9,5%	100,0%
Amazonas	83,1%	9,7%	7,2%	100,0%
Bahia	75,6%	13,8%	10,6%	100,0%
Ceará	65,6%	20,0%	14,4%	100,0%
Distrito Federal	29,8%	53,4%	16,8%	100,0%
Espírito Santo	52,3%	28,2%	19,6%	100,0%
Goiás	46,4%	32,6%	21,0%	100,0%
Maranhão	80,7%	10,5%	8,8%	100,0%
Mato Grosso	54,8%	32,8%	12,4%	100,0%
Mato Grosso do Sul	51,4%	29,4%	19,2%	100,0%
Minas Gerais	62,7%	21,7%	15,6%	100,0%
Paraná	51,4%	30,3%	18,3%	100,0%
Paraíba	67,8%	18,7%	13,6%	100,0%
Pará	77,5%	12,0%	10,5%	100,0%
Pernambuco	69,1%	20,1%	10,8%	100,0%
Piauí	78,8%	10,2%	10,9%	100,0%
Rio Grande do Norte	66,3%	22,4%	11,3%	100,0%
Rio Grande do Sul	66,4%	17,1%	16,5%	100,0%
Rio de Janeiro	65,4%	21,6%	13,0%	100,0%
Rondônia	53,5%	25,3%	21,2%	100,0%
Roraima	62,7%	22,6%	14,7%	100,0%
Santa Catarina	48,8%	41,7%	9,6%	100,0%
Sergipe	63,6%	20,2%	16,2%	100,0%
São Paulo	54,0%	30,5%	15,6%	100,0%
Tocantins	62,1%	20,8%	17,1%	100,0%

Source: IBGE/PNADC-2022

Note: Prepared by the author himself based on IBGE data

The states with the highest percentages of access to the General Sewage Network include the Federal District (86.7%), São Paulo (83.0%), Rio de Janeiro (69.3%), Espírito Santo (65.7%), Minas Gerais (63.1%), Paraná (54.9%) and Rio Grande do Sul (47.5%), indicating a significant advance in basic sanitation infrastructure in these regions, the states with the lowest access rates were Piauí (4.6%), Pará (7.0%), Maranhão (11.9%) and Amapá (11.0%). For those who have a Septic Tank Connected to the Sewage Network, we identified that the highest percentage is 26.0% in Santa Catarina and Rio Grande do Sul (17.0) and the lowest percentage is 0.4% in the Federal District.



Those who used septic tanks not connected to the sewage system had the highest percentages in Piauí (57.7%), Mato Grosso (53.2%), Maranhão (43.0%), Roraima (45.6%) and Paraná (42.3%), while the lowest percentages were recorded in São Paulo (4.7%), Federal District (8.9%), Minas Gerais (10.4%), Rio Grande do Sul (10.5%) and Amazonas (13.9%). For the type of Rudimentary Cesspool, we observed that Tocantins (45.6%) and Sergipe (43.6%) were the ones that most used this type of disposal. For the destination Vala, the highest values were: Acre (15.2%), Amazonas (7.7%), Paraíba (7.6%), Maranhão (7.6%), the last type is sewage disposal for rivers, lakes or sea, the highest percentages were recorded in Amapá (13.7%) and Amazonas (10.2%). It is noticeable that there are federative units that have zeroed or have very low levels in relation to the two types of disposal mentioned above, as is the case of the Federal District, Mato Grosso do Sul, Mato Grosso and Rondônia.

The lack of basic sanitation in Brazil is a frequent theme in various media, reports and academic papers. According to Moro et al. (2015), this deficiency negatively impacts quality of life and has serious consequences for health, especially for the poorest population. The general network or the rainwater network, together with septic tanks connected to the network, are the most suitable methods of sewage treatment, providing a safer means of waste disposal. It is worrying to note that other less effective methods, such as septic tanks not connected to the mains, rudimentary tanks and even direct disposal in rivers, lakes or seas, are still used on a large scale in many regions, including in cities in peripheral areas, in rural areas the vast majority of people do not have access to the correct means of sewage disposal.

According to the Brazilian Agricultural Research Corporation (EMBRAPA), the type of irregular cesspools in rural areas is very common.

It is common in these properties to use rudimentary pits ("black" cesspools, wells, holes, etc.), which contaminate groundwater and, consequently, water wells, the well-known "free-range" wells. Thus, there is the possibility of contamination of this population by diseases transmitted by urine, feces, and water, such as hepatitis, cholera, salmonellosis, worms, among others (EMBRAPA, 2024)

These results allow us to perceive that there are socioeconomic and geographic disparities in the distribution of sewage services among the FUs, especially for the population considered to be of low vulnerability. It is important to note that homes without access to an adequate sewage system are subject to several health risks. In addition, the lack of proper sanitation contributes to a reduced quality of life and causes negative impacts on the environment, affecting the entire society.

Over the years, the State has implemented housing policies aimed at the low-income population, which faces shortages in adequate housing, infrastructure, basic sanitation, and essential utensils, but these policies have proven to be insufficient and inefficient (Gordilho, 2018).



Table 3 shows the distribution of the mean values received from BF per household in each state. The highest mean values were Amapá (528.7); São Paulo (505.6); Piauí (497.7) and Acre (496.8). On the other hand, the states with the lowest average incomes were Rio Grande do Sul (451.0) and Mato Grosso do Sul (455.8). Given the sample size, it is important to determine the standard deviation to understand the dispersion of the values, especially when dealing with a large sample where the dispersion tends to be high.

Table 3 shows the standard deviation of each state in the second column. It is no coincidence that the highest standard deviation is found in São Paulo, with a standard deviation (SD) of 237.7, and Amapá, with a SD of 206.2. This variation in the amounts received is related to family composition, i.e., families with different numbers of people receive different amounts. The values above the LS indicate that some families receive high amounts, reaching more than three thousand reais, while values below the LI suggest families that receive less, they are usually retroactive payments, these values fluctuate more within the state itself, in most cases families receive amounts between R\$ 450.00 and R\$ 530.00 on average per state.

Table 3 - Estimates of the mean distribution, standard deviation and size of the population by Federation Unit of the amounts received from the Bolsa Família program

UF	Average	Standard deviation	N
Acre	R\$ 469.2	114,0	75072
Alagoas	R\$ 496.8	151,8	86863
Amapá	R\$ 490,0	179,5	369835
Amazonas	R\$ 474,0	141,2	31866
Bahia	R\$ 494.7	161,5	926527
Ceará	R\$ 528.7	206,2	74630
Distrito Federal	R\$ 468,8	142,9	110168
Espírito Santo	R\$ 476.6	138,3	872321
Goiás	R\$ 497,7	159,7	422835
Maranhão	R\$ 477.3	126,0	1021021
Mato Grosso	R\$ 464.2	117,2	345689
Mato Grosso do Sul	R\$ 487.2	140,2	499588
Minas Gerais	R\$ 477,9	138,2	1005004
Paraná	R\$ 479,6	138,7	376084
Paraíba	R\$ 474.6	140,7	281473
Pará	R\$ 477.3	141,5	1695737
Pernambuco	R\$ 461.8	141,6	1020350
Piauí	R\$ 472.3	130,8	211757
Rio Grande do Norte	R\$ 487.3	163,6	844217
Rio Grande do Sul	R\$ 505.6	237,7	1364567
Rio de Janeiro	R\$ 469,6	157,6	355167
Rondônia	R\$ 461.1	141,6	99406
Roraima	R\$ 451,0	125,0	336990
Santa Catarina	R\$ 455,8	145,3	116477
Sergipe	R\$ 467.5	167,8	163236
São Paulo	R\$ 465.2	127,4	314922
Tocantins	R\$ 483.2	175,5	86227

Source: IBGE/PNADC-2022

Note: Prepared by the author himself based on IBGE data



By employing statistical inference, we can extrapolate these values received from our sample to a larger population, represented by the letter N. In Table 3, the largest estimated populations per federative unit were: Bahia (R\$477.3), with 1,695,737 inhabitants; São Paulo (R\$505.6), with 1,364,567; Ceará (R\$477.3), with 1,021,021; Minas Gerais (R\$461.8), with 1,020,350; and Pernambuco (R\$477.9), with 1,005,004 inhabitants.

To determine how much of the Bolsa Família (BF) Benefit is used to pay rent in each state, we calculated the ratio between the amount of rent and the amount received, resulting in the percentage spent. Table 3 shows that 40.74% of the FUs commit more than 100% of the amount received to rent. We point out that the states that stand out the most in this aspect are: Santa Catarina (153.0%), Federal District (133.6%), São Paulo (130.2%) and Rio Grande do Sul (129.9%). On the other hand, the states that are less committed to renting compared to the others are: Piauí (56.4%), Paraíba (64.4%) and Alagoas (65.5%).

We observed that the Northeast region is the only one where no federative unit exceeds the amount received with rent, with the highest percentage found in Ceará (74.4%). In the North, only Roraima (101.6%) exceeds this value, while the lowest percentage is in Amapá (77.8%), still higher than the maximum recorded in the Northeast. On the other hand, the South, Midwest and Southeast regions have states with averages higher than the percentage gained, except for Espírito Santo (94.4%) in the South.

A study done by NOGALES, et al (2023) to characterize housing in Brasília highlights that the Federal District is characterized by socio-spatial segregation and marked social inequality, this research cites the Institute of Research and Statistics of the Federal District (IPEDF) which made a study based on data from the District Household Sample Survey (PDAD) 2021, in which the estimated housing deficit was around 100,701 households, and about 10% of the households in the Federal District had precarious living conditions, 65.2% of which were included in the category of excessive burden with rent. This study helps us understand one of the reasons why the BF population has fewer people with their own home and why the amount committed to rent is so high in Brasília. As in Brasília, the majority of the population of the states in the aforementioned regions, which showed that more than 100% of the amount received was committed, suffer from excessive rent burdens, which corroborates the high housing deficit in these regions.

CONCLUSIONS

The relevance of the data provided by the IBGE through the Continuous PNAD for the understanding and development of Brazilian society is notorious. Access to these microdata by the scientific population makes it possible to carry out detailed statistical analyses, boosting not only the facility, but also the independence in the construction of statistical analyses that explore the social



characteristics of the Brazilian population. Through this work, we brought results that can be considered valuable to understand the challenges and opportunities in the housing context of the population benefited by Bolsa Família.

It was possible to verify, through the profile of our sample, that most of the households are located in the urban area (72.9%). The predominant gender is female, with 51.4%, but very close with males (49.6%). Regarding race, most of the interviewees identified themselves as brown (49.6%) and white (39.3%). About 75% of men are under the age of 55, and 75% of women are under the age of 58.

In this context, most BF beneficiaries own their own property, covering about 88.9% of the federative units, with more than 50% of the beneficiaries living in this situation. The FUs that are most are Amazonas and Maranhão exceed 80% of people living in their own property, on the other hand Brasília (29.8%) scores a percentage well below the number of people with their own property, we realize that these percentages vary from region to region, due to the aspects: Financial situation, cost of housing, real estate market, family and lifestyle, In terms of legal and bureaucratic aspects, these states that had lower percentages in relation to home ownership had a high percentage of people living on rent.

We can see that the average amount paid for rent is considered expensive for this population that does not have financial resources and does not even have a fixed income, often depending exclusively on the BF, the south, southeast and midwest regions are the ones that spend more on rent, even spending more on rent than on the amount received by the benefit, having FUs that exceed more than 150% of the amounts received. The Northeast region spends the least on rent. This expenditure can represent a substantial portion of income, directly impacting the ability of households to meet their other basic needs. Regarding the benefit received, it can be seen that the monthly amount of the aid varies greatly within the state compared to the state.

The variable "sewage destination" helped us to analyze one of the conditions of the household, we realized that in most FUs the residents who have their own home the most are the ones who suffer the most from the lack of basic sanitation and those FUs that have less of their own home and pay more with rent have more access to an adequate sewage network. Our variable was very important to verify the condition of basic sanitation, but other variables such as the number of rooms, bathroom, house material, among others, should be considered for a more detailed analysis to verify these housing conditions.

In short, when we look at the beneficiary population of Bolsa Família throughout Brazil, we observe a diversity of housing conditions, but a homogeneity in relation to unfavorable housing conditions. Faced with this social problem, families in vulnerable situations rely on the Bolsa Família program as a fundamental element not only to guarantee food, but also as an opportunity to improve



their housing conditions. As highlighted by Marguti (2018), it is essential to recognize the urgency of technical and political decisions that can address housing precariousness, aiming to provide decent and safe housing for all.




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Influence of body score on bovine female reproduction

 <https://doi.org/10.56238/sevened2024.014-005>

Karlany Victoria Pereira Soares¹, Renê Ferreira Costa², Juddy de Souza Coutinho³, Jaine Aparecida dos Santos⁴, Adriane Stefany Batista dos Santos⁵, Leandra Soares Cristina⁶, Maria Clara Chaves Lima⁷, Ana Ariela Gusmão Versiani⁸, Otaviano de Souza Pires Neto⁹, Daniel Ananias de Assis Pires¹⁰, Isadora Leite e Lopes¹¹ and Isadora Vieira Santos Araujo¹²

ABSTRACT

The objective of this study was to evaluate the influence of the body condition score (BCS) on the pregnancy rate of female cattle submitted to TAI. This was a cross-sectional, descriptive and quantitative study, in which data collection were carried out on bovine reproduction. A population of 600 Nellore females was used, submitted to artificial insemination at a fixed time, submitted to the same FTAI protocol and classified according to the body condition score (BCS) being: low (with index less than 2.5), medium (between 2.6 and 3.0) and high (above 3.1). After data collection, they were organized in excel spreadsheets, in addition to using the graphs available in the tool to treat the information. Through the results obtained with this work, it is concluded that body condition exerts a significant influence on the percentage of pregnancies of animals submitted to the Fixed Time Artificial Insemination (FTAI) program.

Keywords: TAI, Body score, Pregnancy rate.

¹ Undergraduate student in Veterinary Medicine/Unimontes

² MSc in Animal Production// Unimontes

E-mail: renecostavet@gmail.com

³ Undergraduate student in Veterinary Medicine/Funorte

⁴ Undergraduate student in Veterinary Medicine/Funorte

⁵ Undergraduate student in Veterinary Medicine/ UNA University Center

⁶ Master's student in Animal Production/ Unimontes

⁷ Master's student in Plant Production / Unimontes

⁸ Master's student in Animal Production/ Unimontes

⁹ Doctor in Animal Production/ Unimontes

¹⁰ Doctor in Animal Production

¹¹ Master's student in Animal Production ICA/UFMG

¹² Master's student in Animal Production/ Unimontes

INTRODUCTION

With the growing demand of the world market in the purchase of beef for human consumption, it requires great efforts from producers and the agricultural sector emerges as one of the main activities for commercial exploitation, making the activity propitious and very competitive in several segments of activity (EMBRAPA, 2021). In the agribusiness scenario, cattle farming in Brazil is an extremely important practice in the country, with a turnover of US\$ 2.58 billion until August 2022, beef exports had an increase of more than 23% compared to the same period in 2021, one of the largest buyers is the Asian market, which corresponds to 62.4% of all exports of beef products in the country (MAPA, 2022). Due to this high demand for high-quality animal protein, the use of reproductive biotechnologies in order to facilitate and accelerate the production of animal protein is indispensable (BARUSELLI *et al.*, 2018; MAPLETOFT *et al.*, 2018).

The adoption of the breeding season enables the standardization of calf lots, resulting in greater bargaining power and competitiveness in the market, in addition to increasing reproductive efficiency, concentrating calving by establishing a birth season, establishing the formation of uniform batches of calves, establishing a weaning station, is easy to adopt in any property, it helps to concentrate management activities, which optimizes employee operations, makes it easier to identify females with low production rates, helping to guide culling (LINO, 2021).

According to Baruselli, (2022), in Brazil in 2021 there was a growth of (24.6%) in the search for fixed-time artificial insemination (FTAI) protocols, compared to the previous year and (20%) in the number of semen doses marketed compared to 2020. It is important to emphasize that the efficiency of the FAI is directly related to the nutritional and sanitary management strategies of animals, as well as the execution, dosage and type of hormonal compounds and materials used in the FTAI protocols. Thus, the evaluation of alternative protocols that meet the demand and availability of local inputs becomes an indispensable factor for the success of the technique (ALVARADO-ESPINO *et al.*, 2019)

The effects of body condition on fertility are noticeable, and there is a positive relationship between the weight and body condition of cows and reproductive performance (BITENCOURT, 2018). The body condition of each female is correlated with the fertility of the herd, and generally animals with good BCS will have a more satisfactory response to ovulation induction and synchronization protocols, thus ensuring better pregnancy rates and reproductive outcomes, concluding that the body condition score (BCS) is an important predictor of fertility (ABREU; SILVA; GOTTSCHALL, 2018). In view of the considerations presented above, the present study aims to evaluate the influence of body condition score (BCS) on the pregnancy rate of bovine females submitted to fixed-time artificial insemination (FTAI) through data collected at the company Reproduce – Animal Reproduction in the city of Montes Claros – MG.

MATERIALS AND METHODS

This is a cross-sectional, descriptive study with quantitative analysis. The experiment in the city of Montes Claros, Minas Gerais, Brazil.

The animal husbandry contained the date of the FTAI management, the shift in which the animals were submitted to the FTAI, batch, veterinarian responsible for the protocol, number of animals in the batch, description of the batch, identification of the hormonal protocol, identification of the animal (earring or hot mark), reproductive category, situation (presence or absence of the calf at the foot of the cow), body condition score (BCS), breed, ovarian structure, days of management after the beginning of the protocol, bull, origin of semen, inseminator and diagnosis of pregnancy. The animals were kept in an extensive system in pastures of *Brachiaria* SP, *Panicum maximum*, *Andropogon*, *Bufell* and received mineral supplementation *ad libitum*, not interfering in the management, according to the time of year and according to the conditions of each property.

The parameters evaluated were animal category, submitted to the same FTAI protocol and classified according to the body condition score (BCS) being: low (with index less than 2.5), medium (between 2.6 and 3.0) and high (above 3.1).

After data collection, they were organized in Excel spreadsheets. In addition to using the graphs available in the aforementioned tool, new tables and graphs were created to better interpret the results. Only animals that have complete and usable information were used.

RESULTS

From the information obtained from Nelore cattle females submitted to the fixed artificial insemination protocol, 600 animals had a positive diagnosis for final pregnancy (TAI), closing the breeding season from February to April 2023 with a final pregnancy rate of 59.83%. According to Siqueira *et al.*, (2008), pregnancy rates around 50% can be considered reasonable, and inferior results are unsatisfactory, as they do not justify the costs of implementing the hormonal protocol and management. The percentage of pregnant females at the end of the breeding season obtained in this study would justify the use of FTAI. Carvalho *et al.*, (2019).

After the implementation of the FTAI protocol in the selected flocks, it was observed that the animals with a score of 3.00 had a higher pregnancy rate when compared to the animals with a score of 2.5 and 3.25.

According to the data collected from the animals, we can see below in table 1 the bovine females with the highest pregnancy rates.

Table 1: Pregnancy rate of animals

Order/ECC	Total inseminations	Total de DG	Total de Prenhez	Prenhez's rate to the IATF	Distribution (100%)
Bovine females	600	600	359	59,83	100
2,5	200	200	111	55,50	100
3,0	200	200	159	79,50	100
3,5	200	200	89	44,50	100
Total	600	600	359	59,83	

Source: Survey data (2023)

DISCUSSION

Brazil is currently one of the main players in the production and trade of beef in the world, a reflection of a structured development process that has increased not only productivity but also the quality of the Brazilian product and consequently its competitiveness and market coverage. (EMBRAPA, 2017).

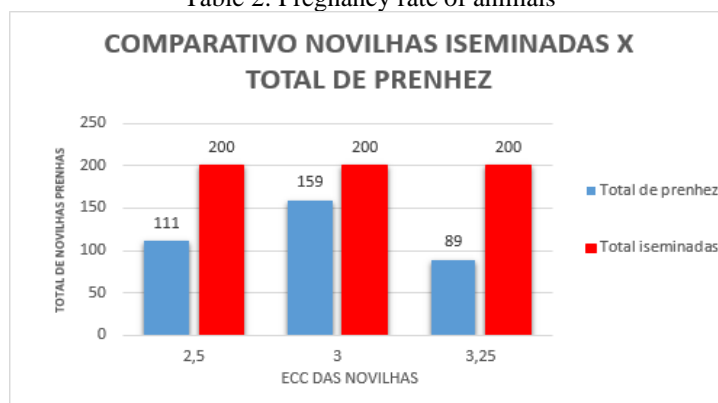
Beef cattle production was highly represented, both in the Brazilian GDP and in the agribusiness GDP. It also showed significant growth in the analysis period. In numbers, it alone accounted for 25.98% of the total agribusiness GDP and 3.64% of Brazil's total GDP (MALAFAIA, et al., 2021).

Reproductive planning on a property becomes, therefore, of fundamental importance to increase the reproductive efficiency of cattle, having an impact on Brazil's GDP (ABIEC, 2020).

The research showed that, with the implementation of methods to improve bovine reproduction and adequate compliance with nutritional requirements in the various stages of reproductive life, it is of fundamental importance for the optimization of the reproductive performance of the herd and, above all, for the maximization of the fertility of the breeding females.

The pregnancy rate of females submitted to the FTAI protocol was 59.83%. Animals with BCS (2.5) and 3.0) showed better results in the FTAI protocols compared to animals with CCS (3.25) as shown in Table 2. It is the result of a number of factors, one of the main ones being the body condition of the female.

Table 2: Pregnancy rate of animals



Source: Survey data (2023).

The body score was based on the subjective analysis of the nutritional status of the animals by means of visual evaluation of the veterinarians who were starting the protocol as a function of muscle coverage and fat mass, on a scale from 1.0 to 5.0 (1 = very thin to 5 = very fat), according to the method developed by Houghton et al. (1990). Adapted for 0.25 intervals.

Animals that have low body condition and are included in the FTAI protocol tend to interfere negatively in the pregnancy rate assessments, as well as animals with high scores, since the accumulation of fat in the reproductive organs can interfere with the estrous cycle. Therefore, for the optimization of the results, it is preferable that the animal presents an intermediate body condition, that is, between 2.5 and 3.0 due to animals with a normal cyclic activity and adequate weight (TORRES et al., 2015).

It is extremely important to emphasize that not only the use of adequate TAI, but also the implementation of other management practices in a property such as good management of nutritional management, monitoring of the CCS of females in the different stages of their reproductive life and adequate supply of their nutritional requirements, will provide a maximization of fertility in beef females. as well as the optimization of the reproductive performance of the herd as a whole, resulting in a considerable increase in the quality and productivity of kilos of calf/ha/year (raw material of this market), increasing our competitiveness in the world meat market. (Torres Junior *et al.*, 2009).

CONCLUSION

Through the results obtained with this work, it is concluded that the body condition exerts a significant influence on the percentage of pregnancies of the animals submitted to the Fixed Time Artificial Insemination (FTAI), where animals with scores higher than 3.00 obtained lower percentages when compared to animals with body condition 2.5 to 3.0.

It is verified that animals with BCS 3.0 have pregnancy averages above 50% indicated by the literature. Therefore, for the successful reproductive management of a herd, it is essential to adopt an adequate nutritional management to improve the body condition of the animals included in the




reproductive program.

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Risky behaviors during children's use of screens

 <https://doi.org/10.56238/sevened2024.014-006>

Ariana de Fátima Pires Bezerra¹, Ayla Camilly Pereira Marques², Carlos Henrique Sousa Santos³, Gabriela Neves de Oliveira⁴, Juliano Ricardo Vasconcelos Sgrancio⁵, Layla Nicole Oliveira Gonçalves⁶, Matheus Silveira Guedes⁷, Nathalie Silveira Placide⁸, Raíssa Honório de Freitas⁹, Synay Raquel Mancor Rodrigues¹⁰, Christine Lima Nacif¹¹ and Juscélio Clemente de Abreu¹²

ABSTRACT

The ubiquity of digital technology has significantly transformed children's interaction with the contemporary world. Excessive screen time is a problem of increasing relevance, due to the impacts on physical and mental health. Considering that there are many challenges being faced by the new generations in the face of the digital age, there was a need to carry out a study to assess risks arising from the digital environment. The focus of this discussion is on screen time, unmonitored use by parents, cyberbullying, the habit of talking to strangers, exposure to inappropriate challenges, violent and sexual content, based on and highlighting the recommendations of the Brazilian Society of Pediatrics (SBP). This discussion, in addition to enriching the existing literature on the subject, aims to present in a theoretical way the fundamental data for the identification of risks and for the future adequacy and security of the digital environment for children. More in-depth studies on the subject become essential for the improvement of children's health and well-being, in addition to subsidizing the development of interventions more appropriate to the reality of children and adolescents, through a deepening of knowledge about the challenges faced by this age group in the digital environment.

Keywords: Children, Risk behavior, Screens, Internet.

¹ Graduating in Medicine
University Center of Caratinga - UNEC

² Graduating in Medicine
University Center of Caratinga - UNEC

³ Graduating in Medicine
University Center of Caratinga - UNEC

⁴ Graduating in Medicine
University Center of Caratinga - UNEC

⁵ Graduating in Medicine
University Center of Caratinga - UNEC

⁶ Graduating in Medicine
University Center of Caratinga - UNEC

⁷ Graduating in Medicine
University Center of Caratinga - UNEC

⁸ Graduating in Medicine
University Center of Caratinga - UNEC

⁹ Graduating in Medicine
University Center of Caratinga - UNEC

¹⁰ Graduating in Medicine
University Center of Caratinga - UNEC

¹¹ Profa. Mental Health Specialist
University Center of Caratinga - UNEC

¹² Prof. PhD in Cytogenetics
University Center of Caratinga - UNEC



INTRODUCTION

In contemporary times, digital technology has significantly transformed ways of life, directly impacting the way children and adolescents interact with the world around them. An emerging phenomenon of growing concern is the exaggerated and/or inappropriate use of screens by this age group, which includes devices such as smartphones, tablets, and computers. This topic gains relevance as children and adolescents, from a young age, are exposed to a variety of digital content that sometimes exceeds the limits recommended by health professionals and child development specialists.

Data from the ICT Kiks Online - Brazil survey (2018), conducted by the Brazilian Internet Steering Committee (CGI.br), revealed that children are exposed to sensitive content about food or sleep; ways to hurt yourself; sources that report on ways to commit suicide and experiences with drug use. In addition, about 26% of participants have already been treated in an offensive way (discrimination or cyberbullying); and 16% reported access to sexually explicit images or videos. Another 25% assumed that they were unable to control their screen time, even though they tried to spend less time on the internet (SOCIEDADE BRASILEIRA DE PEDIATRIA, 2019).

Considering that there are many challenges being faced by the new generations in the face of the digital age, there was a need to generate discussions that would lead to awareness about the safe use of screens and the internet by children, with a language adapted to their understanding. As part of the discipline Extension as a Curricular Component (ECC), an educational work on the safe use of screens was carried out in the year 2023 and, through it, we identified behaviors with potential risk to the health of the little ones. Based on this work, it was found that there is a need to discuss the health risk behaviors presented by children who are exposed to screens and the internet.

It is of utmost importance to investigate the risk behaviors associated with the use of screens by children between the ages of 8 and 12, given the significant influence that the abuse of electronic devices can have on the health and well-being of this public.

With the increased availability of digital technologies and children's increasing exposure to screens and the internet, it is essential to understand the behaviors that can put them in dangerous situations in order to develop appropriate preventive measures and interventions.

On the other hand, another problem that arises when allowing children to access digital content online is that the content they are able to access is often varied and highly inappropriate for their age. This age group may not be mature enough to decide what is good for them, and so they are at risk of being exposed to violence, pornography, dangerous challenges, and having interactions with strangers. Another difficulty concerns the lack of parental supervision and control, which subjects them to *cyberbullying*, and they can become victims of sexual exploitation, and so on.

THEORETICAL FOUNDATION

IMPACT OF SCREEN AND INTERNET USE ON CHILDREN'S HEALTH

According to Santana, Ruas and Queiroz (2021), health professionals around the world have debated the repercussions of excessive use of electronic devices on the growth and development of children without, however, defining what its long-term repercussions would be. In the context of the modern world, screens, once restricted to television, have evolved into pocket-sized, mobile, and portable devices. Therefore, cell phones, tablets, smartphones, due to their portability, have been incorporated into the routine of people from different social backgrounds and age groups, including children. Screen time, which is understood as the total time for which the child remains exposed to all screens, has increased (NOBRE et al., 2021).

We are currently witnessing the proliferation of the use of technology in the daily lives of families, for various purposes, from work to entertainment, communication and personal organization. Children grow up familiar with technologies such as computers, the Internet, video games, tablets and mobile phones, using them to play, learn and communicate. Digital language is part of the lives of these digital natives, and can even alter their thought patterns and the way they learn (PRENSKY, 2001 apud SANTANA; STREETS; QUEIROZ, 2021).

Interactive time in front of a screen works as a stimulant for the central nervous system, whose effects compromise different body and brain processes (DUNCKELY, 2019 apud SANTANA; STREETS; QUEIROZ, 2021). Specialists in the diagnosis and treatment of child and adolescent developmental disorders call "electronic autism" the automation of people's behavior, especially children's, which deprives them of the properly human relationship, of the exchange of looks and words, turning them into a kind of "Pinocchio in reverse", a puppet that has become humanized with experience (PAIVA; COSTA, 2015 apud SANTANA; STREETS; QUEIROZ, 2021).

Obesity, overweight, metabolic syndrome, insomnia, introspection are some of the comorbidities associated with prolonged exposure to electronic devices (DUNCKELY, 2019 apud SANTANA; STREETS; QUEIROZ, 2021), which, once established, will have repercussions for life.

Research related to the consumption of television and computers has shown harmful impacts on children and adolescents, both due to excessive exposure and absorbed content. Television media contributes to the shaping of opinions, stimulating consumerism, shaping concepts and influencing behaviors. However, the frequent and prolonged use of television leads to a series of problems at school and in adolescence, including sleep disorders, isolation, academic difficulties, and even attention disorders (PEDROSO, 2023 apud CRUZ et al., 2024).

Nunes et al. (2023) highlight that the use of video games and other screens carries a series of concerns, including delayed communication development, learning difficulties, attention and concentration problems, increased risk for obesity and other diseases related to the absence of



physical activities, inadequate sleep, elevation and risk of vision problems, such as myopia and risk of violent behavior.

According to Jonathan et al. (2023) in a study with a diverse cohort of children aged 9 to 11 years in the United States, it was observed that the increase in time spent in front of electronic screens was prospectively associated with suicidal behaviors and that, specifically, activities such as texting, video chatting, watching videos, and playing video games were more strongly correlated with suicidal behaviors at a two-year follow-up.

Children who have a high exposure to electronic screens at an early age are more susceptible to developing emotional and behavioral problems. Specifically, prolonged exposure to high amounts of screen time is identified as a risk factor for behavioral problems. Therefore, both parents and educators should be aware of the need to limit children's screen time (LIU, 2023 apud CRUZ et al., 2024). Excessive use of screens can have a negative impact on children's mental health, influencing factors such as sleep, cognitive development, and emotional well-being.

It is important to note that the consequences of excessive exposure to screens in childhood include delayed cognitive and language development, social delays and lack of emotional control, as well as aggressive and anxious behaviors and sleep disorders (ARANTES; MORAIS, 2021).

It is extremely important to approach and disseminate the indicative classification and the screen time limit, since excessive use is associated with several health risks, among them: digital dependence, irritability, anxiety and depression, attention deficit hyperactivity disorders, sleep disorders, overweight/obesity and anorexia/bulimia, sedentary lifestyle, risks of sexuality, nudity, sexting, sextortion, sexual abuse, virtual rape, self-injurious behaviors, suicide induction and risks, increased violence, abuses and fatalities, visual problems, myopia and computer visual syndrome, hearing problems and NIHL noise-induced hearing loss, postural and musculoskeletal disorders, nicotine use, vaping, alcohol, marijuana, anabolic steroids and other drugs. (BRAZILIAN SOCIETY OF PEDIATRICS, 2019).

RECOMMENDATIONS OF THE BRAZILIAN SOCIETY OF PEDIATRICS ON THE USE OF SCREENS

The Brazilian Society of Pediatrics (SBP) is an entity whose mission is to promote the health and well-being of children and adolescents in Brazil, in addition to defending their rights. To meet this objective, it relies on scientific research in order to identify risk situations. In this sense, in view of the persistent presence of screens in the current reality, it was necessary to create guiding manuals for pediatricians, parents, educators (due to the presence of technologies and applications in schools) and for children and adolescents themselves. This need is explained by the importance of identifying



risk factors for the health of children and adolescents associated with the use of screens, whether in terms of quantity of time or quality of content.

The World Health Organization (WHO) has defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease" (WHO, 2007, p. 1). In view of the above and based on the scientific literature, the Health Guidance Manual explores this broad concept #MenosTelas #Mais of health by identifying different risk situations among the various aspects of the lives of children and adolescents in relation to the use of screens, through some guidelines, such as: prohibits, for all ages, the use of screens during meals and asks for disconnection 1-2 hours before bedtime, Between the ages of 6 and 10, screen time should be limited to a maximum of 1 - 2 hours per day and between the ages of 11 and 18 this time extends by 1 hour (2 - 3 hours per day). However, during this time of use, the Manual highlights the need for the supervision of parents or guardians, whose presence and contact in a timely manner, in addition to being essential for the development of their children, is necessary to prevent harmful behaviors, such as isolating children in their rooms or "spending the night" playing. Many of these behavior patterns prevent the establishment of a routine and an adequate night's sleep, which are essential for the expected development for each age (SOCIEDADE BRASILEIRA DE PEDIATRIA, 2019, p. 07).

In addition, the same Manual guides the use of appropriate filters, passwords, moments of family life away from the networks and that parents or guardians establish rules for the use of equipment and applications. In addition, it describes the responsibility of caregivers regarding the type of content the child is accessing, with whom they are exchanging messages and whether they have disrespectful content – situations that constitute a risk behavior for health – in addition to observing if the use is excessive and if it is generating behavioral, physical and mental disorders. Regarding the films, series and other content accessed, it is important to consider the Indicative Classification of the Ministry of Justice and Citizenship, whose criteria are determined as free for all audiences or unsuitable for children under 10, 12, 14, 16 or 18 years of age (SOCIEDADE BRASILEIRA DE PEDIATRIA, 2019, p. 06).

The Health Guidance Manual of #MenosTelas #Mais Brazilian Society of Pediatrics (2019) also highlights noise-induced hearing loss (NIHL) as a result of excessive use of headphones, in addition to the appearance of symptoms of attention deficit hyperactivity disorders. In this sense, the SBP recommends balancing online activities with outdoor activities, encourages family interaction and encourages parents to teach their children to block inappropriate and offensive messages.

The recommendations for pediatricians are the evaluation of the child's and adolescent's screen time, sleep quality, diet, physical exercise, behavior and school performance. It is recommended that professionals observe joint injuries, postural problems, changes in vision and other changes already demonstrated in scientific studies. Other guidelines are: evaluate signs of self-



harm, bullying, cyberbullying, participation in potentially dangerous online challenges, and discuss changing harmful habits and lifestyles (SOCIEDADE BRASILEIRA DE PEDIATRIA, 2016, p. 04).

In this regard, among the recommendations for parents are: talking to their children about the internet and social networks, about appropriate websites, establishing rules and limits in common agreement regarding the use of electronic devices, discussing unpleasant, obscene messages, warning about scams – such as offering fake gifts and gifts – and warning them not to give in to blackmailing and threatening messages. It also advises parents to dedicate quality time to spend with their children and to remember that their behavior is a reference for them. Therefore, there are many guidelines that are available as a form of prevention, because "as always, risk prevention is the best investment for the social protection of the digital generation", according to the Brazilian Society of Pediatrics (SOCIEDADE BRASILEIRA DE PEDIATRIA, 2016, p. 04).

Finally, the 2016 document provides recommendations for children and adolescents themselves. It advises on not sharing passwords, not confusing the virtual world with the real world (the digital world is based on fantasy), blocking offensive messages, and being respectful online. It also advises not to talk to strangers or meet them face-to-face, remember that the internet is an uncontrollable and public environment and, therefore, that the consequences of your actions can have endless repercussions. In addition, it advises on the need to take care of physical and mental health, on remembering that, as human beings, they need socialization and to meet their biological needs, such as hunger and sleep, so that they grow and develop in an adequate and healthy way. As a result, the SBP sought, through these recommendations, to fulfill its role as a promoter of health and well-being (SOCIEDADE BRASILEIRA DE PEDIATRIA, 2016, p. 07).

FINAL GUIDELINES

Mapping the dangers to which children are subject can generate valuable *insights* for the development of prevention and intervention strategies, on the mappings the following stand out:

- Find out the average daily hours that children spend in front of screens, allowing us to assess whether this time exceeds the recommendations of the Brazilian Society of Pediatrics (SBP) and whether there is a link between screen time and possible risky behaviors.
- Analyze behaviors when using electronic devices. This data may reveal how often children use electronic devices during meals and before bedtime, and whether there is any change in sleep pattern after using these devices. This will help us better understand how technology habits can influence children's routine and well-being.
- Check the exhibition online. Through this analysis, it will be possible to assess whether children access the internet without parental supervision, whether they have had



interactions with strangers online, and whether they have been exposed to inappropriate content. The surveys could generate *insights* into children's online safety and the importance of protective measures, such as the use of parental control tools.

- Analyze the impact on behavior and well-being and identify if there is any negative impact on children's behavior in relation to time spent in front of screens. This will help to understand how caregivers perceive the possible effects of technology use on children's mental and emotional health.
- Determine adherence to the age rating, which will indicate whether children follow age recommendations when watching movies and series, allowing us to assess whether parents are aware of and monitoring the content consumed by their children.
- Check whether children have experienced risky online situations, such as cyberbullying, accessing inappropriate content, participating in online challenges, and other similar experiences. This information is key to understanding the specific dangers children face in the digital world.

The discussion on the subject can not only enrich the existing literature on the subject, providing updated and contextualized data on the reality of children between 8 and 12 years old in relation to the use of screens, but can also be a basis for future research.

Through a deeper understanding of risk behaviors, it will be possible to devise more effective digital education and intervention strategies, promoting a healthier and safer use of digital technologies by children.


Thus, it is concluded that, for the protection and healthy development of children, parents, educators and health professionals should be instructed with fundamental data for the identification of risks related to the use of screens, to promote the adequacy and safety of the digital environment for children.



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Anthropometric indicators of the nutritional status of children in early childhood education

 <https://doi.org/10.56238/sevned2024.014-007>

Ivana Almeida Serpa¹, Kati Luzaine Bardim Costa² and Adriana Barni Truccolo³

ABSTRACT

Knowledge of the growth and development profile of children cared for in daycare centers allows the implementation of health promotion and disease prevention actions, contributing to the design of public policies, intersectoral articulation and awareness of the population, enabling the child to achieve a healthy and harmonious development. The aim of this study was to evaluate the neuroanthropometric indicators of the nutritional status of preschool children. A cross-sectional epidemiological study was carried out in 13 daycare centers located in peripheral neighborhoods of a municipality on the western border of RS, with 530 children, 277 girls and 253 in the age group between one and five years old. The anthropometric variables measured were weight, height, and head circumference of the children. The Pearson Correlation Test was used to verify the relationship between head circumference and weight, at a significance level of 5%. The results showed a strong positive correlation between the weight and height of the children, indicating that the tallest children had the highest weights, which is in accordance with the normative tables of the World Health Organization. There was also a strong positive correlation between head circumference and weight, which corroborates what is expected in the specialized literature. It is concluded that the neuroanthropometric indicators of nutritional status, such as weight, height and head circumference, are measures that portray the child's health status and that their periodic evaluation should be adopted in schools in order to monitor the child's growth and development.

Keywords: Child, Growth, Weight, Height, Head circumference, Nutritional status.

¹ Master of Education. State University of Rio Grande do Sul.

E-mail: ivana.serpa@gmail.com

² Degree in Pedagogy. State University of Rio Grande do Sul.

E-mail: kati-costa@uergs.edu.br

³ Master's Degree in Health Promotion. State University of Rio Grande do Sul.

E-mail: adriana-truccolo@uergs.edu.br



INTRODUCTION

Child development is multidimensional, integral and continuous, but it also depends on the interrelations between health and the environment, whose influence can be positive or negative, insofar as it promotes conditions that promote well-being or, on the other hand, contribute to the onset and maintenance of diseases, injuries and traumatic injuries¹.

Children's health is related to a series of indicators influenced by the conditions of the environment in which the child lives and highly dependent on the sufficient and appropriate provision of care, which involve the family's social conditions, access to health services, nutrition, and growth and development are considered the main indicators of their health condition². Knowledge of these indicators can provide support for the implementation of disease prevention and health promotion actions in daycare centers and schools³, and stimulation activities are equally important for the child's neuropsychomotor development to occur harmoniously with growth⁴.

Thus, early intervention becomes an effective strategy to allow the child to grow and develop in an emotionally healthy way^{5,6}.

The Ministry of Health adopts the recommendations of the World Health Organization (WHO) on the use of reference curves in the assessment of nutritional status^{7,8}, which constitute an important technical instrument for measuring, monitoring and evaluating the growth of all children and adolescents aged 0 to 19 years, regardless of ethnic origin, socioeconomic status or type of diet.

Anthropometry is a simple, non-invasive and low-cost method used to assess the size, proportions and composition of the human body⁹. Since growth and body dimensions at all ages reflect the health and well-being of individuals and populations, anthropometric measurements can be used as indicators of health, performance, and survival¹⁰. Recent studies have expanded the applications of anthropometry to identify economic and social inequalities, point out which population should receive intervention, and evaluate responses to interventions^{9,10}.

The W/A indicator is used worldwide in childcare, in the evaluation of children up to five years of age, reflecting weight according to the child's chronological age. Weight is a very sensitive measure and its serial assessment allows for early identification of changes in nutritional status. However, this indicator used alone is not capable of detecting the nature of the disease, i.e., whether it is past or current¹¹. In addition to this limitation, the W/A indicator does not identify the body compartment that is more or less affected by the disease.

Therefore, it is necessary to associate other anthropometric measurements such as height and head circumference to define the nutritional status of the child¹². Thus, the nutritional profile of the child offers valuable information for the planning of actions, aiming at prevention and the programming of care directed to those with deficits already installed and implementing actions that enable the prevention of their effects^{12,13}.



Head circumference is described as the "frontooccipital" circumference or as the "Frankfurt Plane" circumference, corresponding to the maximum head circumference¹⁴. As brain growth occurs predominantly in the first three (3) years of life, this fact has meant that the study of head circumference has been restricted to this period and, to a certain extent, neglected, with few investigations or evaluations that use it after three years of age¹⁵. Some authors, however, have pointed out that its measurement, after three years of age, would be very useful to detect the conditions of nutrition that occurred early and, more than height, the head circumference would be the most appropriate measure to detect malnutrition that occurs in the first years of life^{16,17}. Since this measure is highly correlated with brain size, several studies have sought to clarify the influence of severe and early malnutrition on brain growth^{18,19}. Although the brain presents a certain plasticity in the face of involvements, and neuromotor development depends not only on physiological factors, but also on the environment, it is necessary to have a better understanding of the deleterious effects of malnutrition on the nervous system, as these can lead to the most serious sequelae of the "survivors" of malnutrition in childhood. There is evidence that head circumference may reflect nutritional deficiencies that occurred early in life^{17,18}, and may be a very useful indicator in the planning of actions aimed at minimizing or preventing the effects of early malnutrition²⁰. Reference curves for head circumference are important for the follow-up of children with neurological problems and for a better and more complete nutritional assessment of infants, according to the recommendations of the World Health Organization²⁰ and, at school age, to assess nutritional history²¹.

When environmental conditions meet physiological and emotional needs, the organism can reach the limits of normal development. On the other hand, malnutrition is a risk factor for development; because unfavorable social and economic conditions potentiate its deleterious effects²¹. It becomes evident that the malnourished child without school (lack of stimulation) is the one who is in the worst situation. Children with severe malnutrition have a small head and abnormal EEG for at least one year after the episode²².

Studying the growth and development of children in the context of health education, health promotion and intervention programs is essential for the development of public policies aimed at this age group. Children's health must be considered in a broad context taking into account physical, emotional and social well-being, as advocated by the World Health Organization (WHO). Many of the behaviors included in children's lifestyles can influence, directly or indirectly, their short- or long-term health²².

It is believed that childhood is an optimal period for pedagogical intervention in order to stimulate health habits and behaviors, which are expected to be maintained during the higher course of the child's life. In this context, the school/daycare center is a diversified space for development



and learning, that is, a place that brings together a diversity of knowledge, activities, rules and values and that is permeated by conflicts, problems and differences²¹. It is in this physical, psychological, social and cultural space that individuals process their global development, through activities programmed and carried out in the classroom and outside of it²².

To think about early intervention is to assume its complexity as an intervention methodology that is concerned not only with children in situations of social and economic vulnerability, but with all children. It is through intervention with transdisciplinary teams that it is believed that it is possible to prevent damage to the child's growth and development²³.

The need for intersectoral and transdisciplinary actions, based on the articulation between the managers of the education and health policies of the municipality where the research is carried out, involving the participation of civil society and the university as an active member of this society, is present in order to cooperate in the effective transformation of the preschool environment into a space for managing and promoting health²⁴, as well as contributing to regional development.

Despite the complexity and challenges that preschool faces, it cannot fail to recognize that its resources are indispensable for the overall formation of the child. Pedagogues and educational advisors are trained to carry out health interventions. It is in this space that reflections on the teaching-learning processes and the difficulties that arise in the classroom or at home are carried out²³. The establishment of partnerships between education and health professionals can be advantageous for the construction of new methods, strategies and ways of thinking about how the theme "health" should be approached in the educational environment. From this point of view, the teacher is a health trigger, and can contribute to the process, because the students, especially the younger ones, have the teachers' attitudes as a reference. While this remains true, the way of teaching is less authoritarian and formal; Nowadays, social relationships are more open, favoring dialogue between teachers and preschoolers²⁵.

It is known that diet is a determinant of the cognitive capacity of children and adolescents, and that growth (weight, length/height or head circumference) in the first years of life is consistently associated with better performance in intelligence tests²⁶⁻²⁸. Thus, the following research question emerged: What is the nutritional status of preschoolers aged between two and five years who attend municipal daycare centers in a municipality on the western border of the state of Rio Grande do Sul?

In order to answer the research question, the following general objective was outlined: to evaluate the neuroanthropometric indicators of the nutritional status of preschool children belonging to municipal daycare centers located in neighborhoods on the outskirts of a municipality in the interior of the state of Rio Grande do Sul.

METHODOLOGY

This is a cross-sectional epidemiological study, of an applied nature, with a quantitative approach, carried out with 530 children, 277 girls and 253 boys, living in peripheral neighborhoods of the municipality of Alegrete, on the western border of Rio Grande do Sul, aged between one and five years.

All thirteen public daycare centers located in neighborhoods on the outskirts of the city of Alegrete were visited, and data collection occurred only after authorization from the daycare center management and the signing of the free and informed consent form by the children's guardians. The measures were taken on the premises of the daycare centers, in accordance with the structural organization of the educational establishment. Data collection took place in the morning and afternoon shifts. The data were tabulated by the scientific initiation scholarship holders in an electronic spreadsheet of the Microsoft 365 Office Excel program.

To describe the variables, the data are presented in tables and graphs, with mean and standard deviation. Student's t-test was used to verify the difference between the means of found weight and reference weight, and found height and reference height, with a significance level of 5.0%. Pearson's correlation test was used to verify the degree of relationship between the variables weight and head circumference, with a significance level of 5.0%.

The study was submitted to the Research Ethics Committee of the School of Public Health of the State of Rio Grande do Sul, Opinion 2.497.512 and CAAE 60646416.4.0000.5312.

RESULTS AND DISCUSSIONS

The general objective of the research was to evaluate the neuroanthropometric indicators of the nutritional status of preschool children belonging to municipal daycare centers located in neighborhoods on the outskirts of the municipality of Alegrete, on the western border of the state of Rio Grande do Sul.

For this, 530 children, 277 girls and 253 boys aged between one and five years had their weight, height and head circumference measured and compared with the reference tables of the World Health Organization (WHO). Table 1 shows the means and standard deviations of weight, height, and head circumference (HC) of the boys grouped by age from 1 to 1 year and 11 months (Age I), from 2 to 2 years and 11 months (Age II), from 3 to 3 years and 11 months (Age III), from 4 to 4 years and 11 months (Age IV) and from 5 to 5 years and 11 months (Age V).

When comparing the mean weight of the boys in the age group I with the reference values, it was observed that the mean weight found was significantly higher ($p=0.0001$) than the reference (10.9 ± 0.81 kg); The same was true for height, i.e., the mean height of the boys was significantly higher ($p=0.009$) than the reference value (0.82 ± 0.04 cm). In the WC assessment, the boys had WC

values within the range recommended by the World Health Organization (WHO), as shown in Table 2 (43 to 48 cm).

The group in the age group II (2.6 ± 0.28 years old) had significantly higher weight and height ($p=0.0002$; $p=0.001$, respectively) than the reference values (14.3 ± 1.06 kg; 0.91 ± 0.0 m, respectively). The boys' WC showed normal values for their age (45 to 51 cm) as shown in Table 2.

In the age group III it was no different, the mean weight of the boys was significantly higher ($p=1.6 \times 10^{-8}$) than the reference values (15.3 ± 0.54 kg); as well as in the comparison of the mean height with the values of height (0.99 ± 0.21 m) ($p=3.7 \times 10^{-6}$). WC also presented normal values for age (46 to 52 cm).

In the analysis of the age group IV, both mean weight and height were significantly higher ($p=1.56 \times 10^{-7}$; $p=0.0001$, respectively) when compared to the reference values (17.04 ± 0.54 kg; 1.06 ± 0.13 kg, respectively). It was observed that the WC of the boys is within the recommended range (47 to 53 cm) for their age.

Also in the age group V, both mean weight and height were significantly higher ($p=1.17 \times 10^{-13}$; 1.64×10^{-14} , respectively) when compared to the reference values (18.3 kg and 1.1 m, respectively). The mean WC value of five-year-old boys is also in the recommended range (47 to 53 cm).

Santos et al. (2023)²⁹ conducted a descriptive ecological study, based on secondary data recorded in SISVAN in the last 5 years, of schoolchildren aged 5 to 9 years in the state of Goiás and regional health centers (RS). The prevalence of overweight was around 35% in all health areas, especially in the city of Rio Vermelho, in the state of Rio Grande do Sul (39.2%).

Tables 3, 4, 5, 6 and 7 show the result of the correlation between WC, weight and height of the boys aged one, two, three, four and five years.

Table 3 shows a very weak correlation between WC and weight and WC and height of one-year-old boys, and the same intensity in the degree of correlation occurred with the two-year-old age group, as can be seen in Table 4. On the other hand, a strong positive correlation was observed between WC and weight in 3-year-old boys. The same did not occur between WC and height, where the correlation was weak, as can be seen in Table 5. Four-year-old boys showed a positive and regular correlation between WC and weight and a weak correlation between WC and height (Table 6). A weak correlation between WC and weight and height was observed (Table 7) in five-year-old boys.

Table 1. Mean and Standard Deviations of Weight, Height and WC of boys

Variable	Age I 1.6 ± 0.34	Age II 2.6 ± 0.28	Age III 3.5 ± 0.29	Age IV 4.4 ± 0.30	Age V 5.5 ± 0.40
<i>n</i>	20	39	64	67	63
<i>Weight (kg)</i>	13 ± 1.99	15.2±2.29	17.8±3.18	19.9± 4.16	23.2± 4.14
<i>Height (m)</i>	0.86± 0.06	0.94±0.06	1.03±0.05	1.08±0.06	1.17± 0.05
<i>PC (cm)</i>	46.6± 7.45	50.1±1.75	50.9±1.50	51.6±1.66	52.2 ±1.18

Source: Authors (2024)

Table 2. BW values of children from zero to five years of age according to the WHO

Age	Girls (cm)	Boys (cm)
At birth	31 a 36	31 a 37
1 year	42 a 47	43 a 48
2 years	44 a 50	45 a 51
3 years	45 a 51	46 a 52
4 years	46 a 52	47 a 53
5 years	47 a 52	47 a 53

Source: Authors (2024)

Table 3. Correlation between Weight, Height and WC of boys - 1 year

	Weight (Kg)	Height (m)	PC (cm)
Weight (Kg)	1		
Height (m)	0,69	1	
PC (cm)	0,26	0,35	1

Source: Authors (2024)

Table 4. Correlation between Weight, Height and WC of boys - 2 years

	Weight	Stature	PC
Weight (Kg)	1		
Height (m)	0,76	1	
PC	0,45	0,17	1

Source: Authors (2024)

Table 5. Correlation between Weight, Height and WC of boys - 3 years

	Weight	Stature	PC
Weight (Kg)	1		
Height (m)	0,72	1	
PC (cm)	0,61	0,54	1

Source: Authors (2024)

Table 6. Correlation between Weight, Height and WC of boys - 4 years

	Weight	Stature	PC
Weight (Kg)	1		
Height (m)	0,74	1	
PC (cm)	0,5	0,37	1

Source: Authors (2024)

Table 7. Correlation between Weight, Height and WC of boys – 5 years

	<i>Weight</i>	<i>Stature</i>	<i>PC</i>
Weight (Kg)	1		
Height (m)	0,58	1	
PC (cm)	0,38	0,22	1

Source: Authors (2024)

Table 8 shows the means and standard deviations of weight, height, and head circumference (HC) of the girls grouped by age from 1 to 1 year and 11 months (Age I), from 2 to 2 years and 11 months (Age II), from 3 to 3 years and 11 months (Age III), from 4 to 4 years and 11 months (Age IV) and from 5 to 5 years and 11 months (Age V).

Table 8. Mean and Standard Deviations of Weight, Height and WC of the girls

<i>Variable</i>	<i>Age I</i>	<i>Age II</i>	<i>Age III</i>	<i>Age IV</i>	<i>Age V</i>
<i>N</i>	1.5 ± 0.42	2.6 ± 0.31	3.5 ± 0.28	4.5 ± 0.29	5.5 ± 0.42
<i>Weight (Kg)</i>	34	41	74	78	50
<i>Height (m)</i>	11.5 ± 2.17	14.6 ± 2.05	17.5 ± 3.61	19.8 ± 4.25	22.3 ± 4.8
<i>PC (cm)</i>	0.81 ± 0.07	0.93 ± 0.06	1.0 ± 0.05	1.1 ± 0.64	1.2 ± 0.07
	46.7 ± 2.26	48.9 ± 1.63	50.1 ± 1.38	50.9 ± 1.42	50.6 ± 1.88

Source: Authors (2024)

One-year-old girls had significantly higher BW weight and BW ($p=0.0006$ and $p=0.02$, respectively) than the reference (9.98 ± 1.11 kg; 45.9 ± 1.5 cm), respectively. No significant difference ($p=0.51$) was observed in relation to height.

Statistically significant differences ($p=1.47 \times 10^{-6}$; $p=0.005$; $p=0.0001$) were observed in the weight, height and WC respectively of the two-year-old girls, with measurements higher than those shown in the table (12.7 ± 0.66 kg; 0.9 ± 0.02 m; 47.9 ± 0.35 cm).

In the group of three-year-old girls, a significant difference was found in weight ($p=4.36 \times 10^{-9}$), higher than the table weight (14.8 ± 0.6 kg) and in the BW ($p=1.57 \times 10^{-11}$), also higher than the reference values (48.9 ± 0.21 cm). Three-year-old girls were adequate for their sex and age ($p=0.56$).

Girls in age group IV presented higher and significant values ($p=6.8 \times 10^{-8}$; $p=0.001$ and $p=4.5 \times 10^{-12}$) for weight, height and wor, respectively, when compared with the reference means (16.9 ± 0.55 kg; 1.05 ± 0.12 m and 49.6 ± 0.16 cm).

The results agree with the study conducted by the Ministry of Health (2022), which showed, when analyzing the temporal trend of overweight among preschoolers in the years 1989, 1996, and 2006, that there was a 160% increase in the prevalence of overweight children under 5 years of age, an average increase of 9.4% per year 30.

When comparing the mean weight of the girls in age group V with the reference values, it was observed that the mean weight found was significantly higher ($p=1.76 \times 10^{-7}$) than the reference weight (22.3 ± 4.8 kg); the same was true for height, i.e., the mean height of five-year-old girls was significantly higher ($p=4.35 \times 10^{-8}$) than the reference value (1,09). In the WC assessment, the girls

had WC values within the range recommended by the World Health Organization (WHO), as shown in Table 2 (47 to 52 cm).

Silva *et al.* (2023) comment that the early onset of consumption of industrialized products with low nutritional value is a contributing factor to the development of unhealthy habits in childhood and reflect on the role of school, where children spend a substantial amount of time, in promoting healthy eating³¹.

Tables 9, 10, 11, 12 and 13 show the *r* values when associating Weight and WC, Weight and Height and WC and Height. Table 9 shows a strong correlation between the above-mentioned variables. Table 10 shows a weak positive correlation between WC and height and a strong positive correlation between WC and weight. In the qualitative evaluation of the 3-year-old girls, the group of 3-year-old girls showed a positive and very weak correlation between WC and weight and WC and height (Table 11). As can be seen in Table 12, 4-year-old girls showed a weak positive correlation between WC and weight and between WC and height. On the other hand, when analyzing the group of five-year-old girls, a strong positive correlation between WC and weight and a regular positive correlation between WC and height was observed (Table 13).

Table 9. Correlation between Weight, Height and WC of girls –1 year

	<i>Weight</i>	<i>Stature</i>	<i>PC</i>
<i>Weight (Kg)</i>	1		
<i>Height (m)</i>	0,78	1	
<i>PC (cm)</i>	0,67	0,64	1

Source: Authors (2024)

Table 10. Correlation between Weight, Height and WC of girls – 2 years

	<i>Weight</i>	<i>Stature</i>	<i>PC</i>
<i>Weight (kg)</i>	1		
<i>Height (m)</i>	0,66	1	
<i>PC (cm)</i>	0,61	0,42	1

Source: Authors (2024)

Table 11. Correlation between Weight, Height and WC of girls – 3 years

	<i>Weight</i>	<i>Stature</i>	<i>PC</i>
<i>Weight (Kg)</i>	1		
<i>Height (m)</i>	0,69	1	
<i>PC (cm)</i>	0,38	0,33	1

Source: Authors (2024)

Table 12 Correlation between Weight, Height and WC of girls – 4 years

	<i>Weight</i>	<i>Stature</i>	<i>PC</i>
<i>Weight (Kg)</i>	1		
<i>Height (m)</i>	0,73	1	
<i>PC (cm)</i>	0,496	0,469	1

Source: Authors (2024)

Table 13 Correlation between Weight, Height and WC of girls – 5 years

	<i>Weight</i>	<i>Stature</i>	<i>PC</i>
<i>Weight (kg)</i>	1		
<i>Height (m)</i>	0,79	1	
<i>PC (cm)</i>	0,69	0,56	1

SOURCE: AUTHORS (2024)

FINAL THOUGHTS

The objective of this research was to evaluate the neuroanthropometric indicators of the nutritional status of preschool children belonging to municipal daycare centers located in neighborhoods on the outskirts of the municipality of Alegrete, on the western border of the state of Rio Grande do Sul.

Thirteen daycare centers in the city of Alegrete were visited and weight, height and head circumference measurements were measured and correlated with 530 children, 277 girls and 253 boys aged between one and five years, with mean ages of 3.76 years and 3.96 years, respectively.

When analyzing the correlation between Weight and Height, in all age groups, both for girls and boys, a strong positive correlation was found, as established by the WHO, with the exception of five-year-old boys who were borderline.

Interestingly, important differences were found between boys and girls at all ages, such as at the age of one year.

While there was a strong positive correlation between BW and weight and between BW and height in the group of girls, the same did not occur with boys who showed a weak positive correlation.

At the age of 3 years, the opposite was found in one-year-old children, that is, now boys showed a strong positive correlation between BW and weight, but the same did not happen with girls who showed a regular positive correlation. At five years of age, there was again a weak correlation between WC and height and WC and weight for boys, and a strong correlation between WC and weight for girls.

An important point to be mentioned was the opportunity to carry out the evaluation of all children regularly enrolled and present on the day of visitation to the daycare centers, which contributes to the safe interpretation of the results, ensuring their power of generalization.



It is intended to continue the research by evaluating children from private schools and municipal schools of basic education, that is, the entire population of children from zero to five years and eleven months residing and regularly enrolled in schools in the municipality, expanding the age and making the sample size more robust, with a goal of one thousand children.

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Teaching vaccination and vaccine: An experience report during the COVID-19 pandemic

 <https://doi.org/10.56238/sevened2024.014-008>

Francisca Faustilene da Silva Ribeiro¹, Antônio Celso da Silva Alves², Millena Raimunda Martins de Almeida Carvalho³, José Fernando Santos Rodrigues Junior⁴, Sumaia Almeida Ramos⁵, Elisângela Soares Ribeiro⁶, Anderlyvia Nunes Franklin⁷ and Gualberto de Abreu Soares⁸

ABSTRACT

Vaccination is a public health action that has a good impact on individual and collective health (MALAGUTTI, 2011). When a person is vaccinated, the population is also protected. The general objective of this paper is to present an experience report on the development of an Investigative Teaching Sequence (SEI) with key concepts about vaccine and vaccination, developed with students of the second year of High School Integrated with Health Professional in the PROEJA modality. The experiment took place in two classes of 50 minutes each, with students from the second year of the High School Integrated to the Health Professional of the PROEJA modality. The classes took place during the second semester of 2020 and remotely, through an instant messaging application WhatsApp group. The topic covered in the classes was Immune System and the content was vaccine and Covid19 vaccine. The theme and content were developed in the classes of the Biology discipline. A total of 17 students participated. And for the development of these classes, notebooks, smartphones and textbooks were used. At the end of the process of applying SEI to the development of teaching by inquiry, we can infer that placing the student at the center of the process is a challenging task and because of two variables that are difficult to manage, which are: 1st - The student away from the school floor has difficulty interacting with his peers and with the teacher and this creates a natural resistance to new ways of learning. 2nd - Innovative actions that take the student out of their comfort zone are always rejected at first.

Keywords: PROEJA, Student protagonism, Teaching by research.

¹ Specialist in Clinical Cytology
State University of Piauí

² Master in Biology Teaching
State University of Piauí

³ Vocational Education Specialist
Federal Institute of Piauí

⁴ Master of Science in Mathematics Education
State University of Southwest Bahia

⁵ Professional Master in Mathematics
Federal University of the São Francisco Valley

⁶ Master in Science Education and Teacher Training
State University of Southwest Bahia

⁷ Degree in Pedagogy
Piauí State Department of Education

⁸ Master in Biology Teaching
State University of Southwest Bahia



INTRODUCTION

Immunology is the branch of biology that studies the immune system in all organisms (from invertebrates to vertebrates). This area of knowledge deals with the anatomy and physiology of an individual's immune system that aims to maintain the body's homeostasis in interaction with the environment and with itself. Topics related to immunology are still rarely discussed in basic education classrooms, despite the consolidation of the autonomy of this discipline in relation to others in biology. In addition, there are few studies that address the issue of didactics for the teaching of immunology and its particularities within high school (TOLEDO et al., 2016).

Vaccination is a public health action that has a good impact on individual and collective health (MALAGUTTI, 2011). When a person is vaccinated, the population is also protected. The effect achieved when some people are indirectly protected by vaccinating others is called collective protection or herd immunity or herd immunity. Such immunity happens when a high percentage of the population is vaccinated. However, for herd immunity to occur, it is necessary for the vaccine to prevent the transmission of the infectious agent, as well as to prevent the disease (LEVINSON, 2016). By choosing not to get vaccinated or not to vaccinate their children, there is an increased risk of illness for vaccinated people who have not developed immunity and for others who are not vaccinated (LEVI; LEVI; OSELKA, 2018).

On the internet and especially on social networks, there are people who spread negative information about vaccines, and expose various reasons against vaccination campaigns (LEVI, 2013). The arguments for not getting vaccinated are multiple and of a religious, ethical, political and even scientific nature, in addition to lack of interest or negligence (LEVI; LEVI; OSELKA, 2018).

Basic education plays an important role in the formation of citizens and the construction of individual and collective awareness in relation to health and disease prevention. In this context, teaching should prioritize subjects and activities that provide the individual's awareness of social issues (FREITAS; MARTINS, 2008). High school, the final stage of basic education, aims to consolidate and deepen the contents learned in elementary school, basic preparation for work and citizenship, improvement of the student for ethical training, intellectual autonomy and critical thinking, and development of the ability to relate theory with practice in each discipline studied (BRASIL, 2010).

The teaching of Biology allows the student to understand the relationships between living and non-living beings, proposing and stimulating discussions and debates in the school and social context from the acquisition of scientific knowledge. However, students usually have difficulties in learning this discipline because it has a variety of terminologies and themes at the molecular level, making it difficult to consolidate knowledge, in addition to being disconnected from the students' realities (PEREIRA & MIRANDA, 2017). Teaching in the discipline of Biology is generally based on

technical rationality, where the mere transmission of content is prioritized, without providing the interaction of the teacher with the students, and of the students among themselves in the teaching and learning process (VINHOLI-JÚNIOR & PRINCIVAL, 2014).

For Sasseron and Machado (2017), teaching should provide research, the development of scientific thinking skills that promote creativity in relation to the world. According to the authors, an investigative activity should require and stimulate the creativity of the student so that they can question the reasons for a phenomenon and understand it. In order to assist the investigative process of students, the Investigative Teaching Sequences (SEI) allow the construction of knowledge from the interactions they make with the physical and social environment, with the teacher having the role of assisting in the organization of ideas, guiding and stimulating activities and mediating between the knowledge constructed by the students and scientific knowledge (CARVALHO, 2013).

The general objective of this paper is to present an experience report on the development of an Investigative Teaching Sequence (SEI) with key concepts about vaccine and vaccination, developed with students of the second year of High School Integrated with Health Professional in the PROEJA modality.

METHODOLOGY

The experiment took place in two classes of 50 minutes each, with students from the second year of the High School Integrated to the Health Professional of the PROEJA modality. The classes took place during the second semester of 2020 and remotely, through an instant messaging application WhatsApp group.

The topic covered in the classes was Immune System and the content was vaccine and Covid19 vaccine. The theme and content were developed in the classes of the Biology discipline. A total of 17 students participated. And for the development of these classes, notebooks, smartphones and textbooks were used.

The experience report was carried out from the perspective of a professor who organized, guided and guided the investigative activities of the SEI, in addition to evaluating at the end the acceptance of the investigative approach through the SEI, as a promoter of the teaching and learning of students of the PROEJA modality.

SEQUENCE OF INVESTIGATIVE TEACHING (SEI).

The stages of the teaching by investigation sequence (SEI) were distributed in 2 remote classes of 50 minutes each and that take place through an instant messaging application (*WhatsApp*). The SEI kicked off the problem situations: **What does a Covid-19 vaccine need to have to be effective?** e **In a vaccination campaign, which target audience should be vaccinated first?** After

presenting the problem situations, we will start the entire process investigated, as shown in chart 1 below.

Chart 1: Synthesis of the SEI stages

Stage	Class	Theme/ Concept	Description of the Activity
1st Problematization and Hypothesis Raising	First	Vaccine and Vaccination	Presentation of the problem situations: What does a Covid-19 vaccine need to be effective? In a vaccination campaign, which target audience should be vaccinated first?
			Survey of (hypotheses) answers to problem situations. Guidance for students to research on the key concepts of vaccine, vaccination, vaccines against covid19 and priority public for a possible vaccination and immunization campaign against covid19.
2nd Presentation and discussion on the data found in the research on the key concepts of vaccine, vaccination, vaccines against covid19 and priority public for a possible vaccination and immunization campaign against covid19.	2nd	Covid-19 vaccine and vaccination	Presentation of key concepts by students about vaccine and vaccination. Resumption of problem situations with discussion with students about the relationship between key concepts and problem situations.
3rd Consolidation of the investigative process with the presentation by the students of their solutions to the problem situations		Covid-19 vaccine and vaccination	Presentation of the students' conclusions on the answers to the problem situations in the form of audio and by the instant messaging application (<i>WhatsApp</i>)
		Covid-19 vaccine and vaccination	Presentation of a questionnaire by google form to assess the students' acceptance of the methodology used during classes on vaccination and vaccination.

Source: Author's own.

In the first stage of the SEI, the class was presented with the topic of vaccine and vaccination with two questions:

- ✓ What does a Covid-19 vaccine need to be effective?
- ✓ In a vaccination campaign, which target audience should be vaccinated first?

Soon after, the presentation of the problem situations, the students were heard with their hypotheses about the solutions to the problem situations and then they were instructed to carry out research on the key concepts of vaccine, vaccination, vaccines against covid19 and priority public for a possible vaccination and immunization campaign against covid19.

In the second stage of the development of the SEI, which corresponds to the second class, the students presented the key concepts of vaccine and vaccination. And soon after the teacher resumed the discussion about the problem situations, where the students were stimulated to again present possible and plausible solutions according to the research they did.



To conclude the SEI and the investigative teaching process, the teacher asked the students to present their conclusions regarding the solution to the problem situations presented in the 1st class of the SEI, about vaccine and vaccination. This presentation should be the consolidation of the knowledge acquired by the students during the investigation and the discussions made with the teacher.

In order to know the students' acceptance of the development of the SEI, the teacher will present them with a form, in the form of a google form, for them to respond and thus give their opinion on teaching by investigation with the use of a SEI.

DISCUSSION

The statements analyzed from that moment were extracted from the discursive interactions between the students and the teacher during the application of the SEI and were transcribed and organized in 3 moments that demarcate the way in which the investigative activity was developed in the remote classroom.

The students and the teacher who participated in the remote class were given fictitious names to preserve their identities and maintain anonymity.

1st Moment - Problematization and Hypothesis Raising.

During the first class of the SEI it was agreed with the students that there would be a debate and that they should give their own opinions and without consulting on the web regarding two problem situations:

- ✓ What does a Covid-19 vaccine need to be effective?
- ✓ In a vaccination campaign, which target audience should be vaccinated first?

In the beginning, the debate, as an explanation and raising of hypotheses, took place only about the first problem situation, as we can see in the description of the statements in table 1, below.

Table 1. Description of the dialogues carried out in a *WhatsApp* group corresponding to the classroom.

Characters	Talk
Professor	Guys, today we will have a debate to do during class and we will finish in the next classes. And for today the main rule is: you cannot access the web to seek answers to the questions that will be asked to motivate the debate. I'm going to ask you two questions about a topic that is always appearing in the media, on social networks and even in corner conversations and each one of you should answer with what you know and/or what you think about the question. They can't access the internet to see the possible answers. The 1st first question is: What to have in the future covid19 vaccine for it to be effective, so that it solves the problem of covid-19 contamination??
Maria	Antibodies
Antônia	Antibodies or something that makes our body produce the antibodies.
Josélia	Something to fight the virus.
Paula	Antibodies or something that makes our body produce the antibodies.
José	Antibodies.
Professor	Guys, in the vaccine there will be something to make our body produce antibodies or it will already have the antibodies, both things cannot be had.
Maria	Microorganisms, I guess.
Professor	Should there be microorganisms in the vaccine?
Maria	Yes, professor, I think that the vaccine should have microorganisms to protect us against the virus.
Characters	Talk
Joaquim	Professor, there must be a poison that kills the virus, because then we would have a cure.
Professor	Ok guys. Let us now move on to the second question. When the vaccine arrives, who should be vaccinated first? And why?
Joaquim	The elderly.
Joana	The galley not caught. Because I think that those who have already caught it, already have antibodies.
Maria	Elderly people and children, because they are more fragile.
Josélia respondendo a Joana	But there are people who have already taken it more than 2 times.
Professor	This issue of infection is still being studied, but there are some cases. So guys, does anyone else have any idea who should get vaccinated first?
Antônia	Yes, people who have already acquired the virus have respiratory problems and the elderly, I think, and those who have a chronic disease.
Paula	People who are more predisposed to contracting the virus.
Professor	Guys, we must end the class and you had many hypotheses about the two problems exposed here in the form of questions. Thank you in advance and I'll leave two texts and videos for you to study and in the next class you can say if you've changed your mind or not.

Source: The author's.

During the first SEI class, it can be observed that the students expressed their opinions about the problem situations regarding the vaccine and the vaccination of covid19 and this is easily verified by the dialogues portrayed in Table 1.

According to Borda Carulla (2012), even though students are not able to formulate hypotheses based on scientific knowledge, they should be encouraged to make predictions based on their experiences, to differentiate them from simple guesses. And this was verified during the hypothesis survey, because in the interaction with the teacher, the students did not perform web research on the topic addressed and this is verified by the analysis of the hypotheses constructed and portrayed in table 1.

2nd Moment - Presentation and discussion on the data found in the research on the key concepts of vaccine, vaccination, vaccines against covid19 and priority public for a possible vaccination campaign for immunization of covid19.

In the second class, which took place exactly eight days after the students raised hypotheses, they were asked to explain their ideas about the research they did and the topic they studied.

According to Cardoso and Scarpa (2018), at the end of the investigative process, students should know how to describe, criticize, evaluate, and discuss the topic discussed, and this is verified in the students' explanations in table 2 below.

Table 2. Description of the dialogues on the students' explanations regarding the research carried out on the key concepts of vaccine, vaccination, vaccines against covid19 and priority public for a possible vaccination campaign for immunization of covid19.

Characters	Talk
Professor	Guys, now that we've made the call, what did you discover during your research and investigation?
Maria	A vaccine is a substance that causes the body to produce antibodies.
Antônia	It is killed or weakened virus.
Professor	So, guys, what else? What else does there have to be in the vaccine or rather, what else can there be? I wanted to see the participation of the other students.
José	Proteins of the virus. Vaccines have proteins from invaders.
Paula	The part of the virus that might be used is genetic material, virus protein. The virus can be both active and inactive in the vaccine!
José	Teacher, is it easy to get a vaccine? Is it fast?
Professor	Does anyone know how to answer José, did anyone see this during the investigation?
Maria	Teacher, I saw that it is not easy, because it has 4 steps and it takes 1 to 4 years to do all of them.
Antônia	Guys, what about the covid19 vaccine?
Professor	Yes, professor, about the covid19 vaccine it can have a dead, weakened virus or a piece of it. That's what I understood.
Professor	And why will it heal us?
Joaquim	Teacher, can I answer?
Professor	Can you, say Joana, what have you discovered?
Maria	Professor, reading the articles you left and watching the videos, I didn't see anything about a cure, but I saw that the vaccine will stimulate our immune system to produce antibodies and thus we are protected against covid19.
Professor	Well done folks, but what about who should get vaccinated first? What did you guys discover from your investigation?.
Joana	People who are on the front lines of the coronavirus.
Professor	Alone?
Joana	Non-teacher, the elderly and people with comorbidities.
Professor	Guys, well done. Our problem situations have been solved by you and now you know what can be in a future covid19 vaccine and in the case of a future vaccination campaign who should be vaccinated first. Now let's take advantage of these last minutes of the class for you to answer a questionnaire that I will leave for you to give your opinions on this way of discussing the learning topics of our discipline. OK?
Josélia	Alright, you can send it.

Source: The author's.

In this class of discussion and presentation of conclusions, the students were more objective and brought more elaborate and scientific terms to their dialogues. Thus, it can also be observed, according to Carvalho (2018), that during the development of this SEI, degree 3 of intellectual



freedom was reached, where the teacher proposed the problem, the students presented their hypotheses and sought to do their research and investigations under the guidance of the teacher. And that at the end, the problem questions were taken up by the teacher so that the students could present their conclusions.

At the end of the execution of the SEI, a questionnaire was given to the students with the objective of consulting them regarding the acceptance of teaching by investigation with the use of a SEI. As a result, the majority (55%) gave a score of 8 and 9, where 0 (zero) was the lowest score and 10 (ten) the highest, for the way in which the content of vaccine and vaccination was worked, that is, in an investigative way. But the acceptance score is countered with the opinion on, would they like to see this way of introducing new learning topics being done in other disciplines? If so, which ones? 70% said "no" and only 30% said "yes" and in all subjects.

According to Colenci (2000), when students receive ready-made knowledge, they do not worry about looking for new ways of learning, and this may explain the students' non-acceptance of replicating investigative teaching for other disciplines, as answered by the students.

FINAL THOUGHTS

At the end of the process of applying SEI to the development of teaching by inquiry, we can infer that placing the student at the center of the process is a challenging task and because of two variables that are difficult to manage, which are:

1st - The student away from the school floor has difficulty interacting with his peers and with the teacher and this creates a natural resistance to new ways of learning.

2nd - Innovative actions that take the student out of their comfort zone are always rejected at first.

But, even with the difficulties observed, the investigative process and the student protagonism occurred satisfactorily, as we easily observed the growth and scientific empowerment of the students when comparing the hypotheses and conclusions presented in the first and second classes respectively by the students.


It is not easy to break paradigms, but it is gratifying when, under good guidance, we observe that students have a lot of potential to manage their teaching and learning processes.



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Artificial Intelligence in Brazilian public management: Challenges and opportunities for government efficiency

 <https://doi.org/10.56238/sevned2024.014-009>

Eduardo Silva Vasconcelos¹ and Fernando Augusto dos Santos²

ABSTRACT

The integration of Artificial Intelligence (AI) into public management represents a potential revolution in the way government services are delivered in Brazil. This study explores the complexities, opportunities, and challenges associated with AI adoption, with a special focus on analyzing the ethical, legal, and technological barriers that shape this transformation. Through detailed investigation, we identified that while AI has the potential to significantly improve efficiency, transparency, and innovation in government processes, its implementation faces significant obstacles, including inadequate infrastructure, lack of quality data, regulatory challenges, and deep-seated ethical concerns. The study highlights that the effective adoption of AI requires not only the enhancement of technological infrastructure and the training of personnel, but also the development of a robust legal framework and ethical policies that ensure the responsible use of the technology. It is argued that it is crucial to establish clear regulations and governance mechanisms to overcome these challenges, ensuring that AI is used ethically and that it contributes positively to public administration. The final considerations reiterate the need for a holistic and thoughtful approach, suggesting that success in integrating AI will depend significantly on continued investments in technology, education, and legislation. In addition, future directions are proposed for research that evaluates the long-term impact of AI and that explores comparative international strategies such as benchmarking to improve Brazilian legislation. This work concludes that AI, if implemented responsibly and strategically, can serve as a powerful lever for the modernization and efficiency of the public sector, improving the quality of services offered to citizens and strengthening government transparency and accountability.

Keywords: Artificial Intelligence, Public Management, Government Efficiency, Public Policies.

¹ Doctor in Sciences - Information Processing
Instituto Federal Goiano
Goiânia, Goiás, Brazil
E-mail: educelos1@gmail.com

² Master in Agribusiness
Instituto Federal Goiano
Cristalina, Goiás, Brazil
E-mail: fernando.augusto@ifgoiano.edu.br

INTRODUCTION

The integration of Artificial Intelligence (AI) in the public sector emerges as one of the most notable advances in the management of government entities in the modern era, especially in Brazil, where its adoption promises to revolutionize everything from the formulation and evaluation of public policies to the improvement of citizen service. This study is based on the critical importance of exploring, understanding and proposing effective methods to integrate this technology in the context of Brazilian public administrations, with the aim of optimizing processes and raising the quality of services provided to the population.

The study of AI in the public realm is vital due to its potential to increase operational efficiency, reduce costs, and improve the quality of decisions through data analysis. AI can provide innovative solutions to persistent challenges in critical industries such as healthcare, education, security, and resource management, which are often constrained by limited resources and increasing demands. Therefore, its exploration transcends opportunity, becoming a pressing need for the Brazilian public administration (Barros & Oliveira, 2021a).

In addition, it is imperative to analyze the impact of AI on planning strategies and public policies in Brazil to ensure ethical and transparent use that genuinely contributes to sustainable development. This involves a careful assessment of the benefits and ethical, regulatory, and implementation challenges, ensuring that the use of AI is aligned with democratic principles and respect for human rights (Carvalho & Neto, 2020a).

Before we delve into this study, it is crucial to clearly establish the objectives that will guide the investigation. These objectives are fundamental, as they not only structure the investigation, but also delimit the scope of the analysis, ensuring a clear focus and systematic exploration of topics related to the use of Artificial Intelligence in public management. In this way, they serve as compasses that guide the intellectual path of this work, ensuring that each stage of the research effectively contributes to the insights and understandings we seek to develop.

The general objective outlines the main orientation of this study. Thus, it was established that this is: To investigate the potential of Artificial Intelligence as a tool to optimize the effectiveness and efficiency of public management in Brazil, examining its applications, benefits and challenges in the improvement of processes and in the formulation and evaluation of public policies.

The specific objectives detail the particular aspects to be examined in order to achieve a comprehensive understanding of the topic. They are: (1) to explore the main Artificial Intelligence technologies implemented globally in the public sector and evaluate their applicability in the Brazilian context; (2) identify the impacts of AI implementation on Brazilian strategic planning and public policy formulation, with a focus on efficiency, transparency, and innovation; and (3) analyze

the ethical, legal, and technological challenges and barriers that influence the adoption of AI in public management in Brazil.

METHODOLOGY

The methodology employed to achieve the objectives of this study is the systematic review of the literature, chosen due to its ability to provide a comprehensive and structured view on a specific field of study, in this case, the intersection between artificial intelligence and public management. The systematic review will allow us to identify, evaluate, and interpret all available relevant research related to the use of AI in public management. This method is particularly valuable for capturing a variety of perspectives and evidence on the current state of the art, emerging trends, and gaps in existing knowledge (Gil, 2002).

To develop this work, a bibliographic search will be carried out in reliable sources, such as academic articles, books and government reports, to theoretically support the analysis. The bibliographic research, as pointed out by Gil (2002), is developed based on material already elaborated, mainly books and academic articles. This approach is essential in any academic research process, as it includes seeking, selecting, and critically analyzing a wide range of bibliographic materials related to the field of study. The main advantage of literature search is its ability to cover a wider spectrum of phenomena than would be possible through direct investigation.

RELEVANCE OF THE WORK

This work stands out for its relevance and innovation in exploring the application of artificial intelligence in Brazilian public management, a field still little explored and with significant potential for transformation. Focusing on the integration of AI into management practices, strategic planning, and public policymaking, this research not only responds to an emerging need for modernization and efficiency in the public sector, but also addresses the ethical and structural challenges that come with the adoption of advanced technologies. Using a rigorous systematic literature review approach, this paper offers a detailed and up-to-date analysis of both global and national initiatives, providing valuable insights that can guide future implementations and policies. Thus, the work contributes significantly to the academic literature and administrative practice, positioning itself as an essential resource for the responsible and effective adoption of AI-based solutions in the Brazilian public context, aligning technological innovation with social benefits and sustainable development (Barros & Oliveira, 2021b).

Therefore, the relevance of this research lies in its ability to contribute significantly to the existing literature, offering deep insights into the application of advanced technologies in public



management and inspiring innovative policies that can fundamentally redefine public administration in Brazil.

GLOBAL APPLICATION OF ARTIFICIAL INTELLIGENCE IN THE PUBLIC SECTOR: A COMPARATIVE ANALYSIS WITH THE BRAZILIAN CONTEXT

The integration of Artificial Intelligence (AI) technologies into public services has proven to be a growing trend around the world, playing a crucial role in transforming sectors such as healthcare, education, security, and resource management. AI in the public sector is praised for its ability to increase efficiency, improve decision accuracy, and deliver personalized services at scale, addressing complex challenges that are inherent in resource limitations and increased demands (Smith, 2020; Johnson & Khanna, 2021).

OVERVIEW OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE PUBLIC SECTOR

The adoption of Artificial Intelligence (AI) technologies in the public sector has achieved exponential growth in several countries, driving significant improvements in efficiency, accessibility, and personalization of the services offered to the population. This expansion is reflected in a number of innovative implementations in vital sectors such as healthcare, education, and security, where AI contributes to resource optimization and more informed decision-making.

AI Technologies in Healthcare

In the healthcare industry, AI has been instrumental in the development of advanced and personalized diagnostic systems. For example, in Finland, AI systems are used to analyze large volumes of patient data, allowing for faster and more accurate diagnoses of diseases such as cancer and diabetes. Additionally, AI-based virtual assistants have been implemented to manage appointments and optimize patient flow in hospitals, improving operational efficiency (Nielsen, 2021).

AI Technologies in Education

In education, AI has transformed the way content is delivered and personalized to meet individual student needs. In Singapore, adaptive learning platforms that use AI to analyze student performance are being employed to provide personalized educational resources, significantly increasing student engagement and achievement (Chen & Wong, 2020).

AI Technologies in Security

In the field of public safety, AI has been a valuable tool for data analysis and surveillance. In the UK, AI-based facial recognition systems are used to identify individuals in public places and assist in crime prevention, demonstrating the technology's ability to improve public safety without compromising efficiency (Taylor, 2022).

Table 1: Applications of AI in the Public Sector

Sector	Country	AI Technology	Benefits
Health	Finland	AI-powered auto-diagnostics	Fast and accurate diagnostics
Education	Singapore	Adaptive learning platforms	Personalization of teaching, increased performance
Safety	United Kingdom	Facial Recognition Systems	Improved crime prevention

Source: Prepared by the author (2024)

Table 1 offers a concise overview of how different countries are implementing AI technologies in key sectors such as healthcare, education, and security. This analysis provides a deeper understanding of the benefits and challenges associated with these implementations and indicates pathways for the adoption of these technologies in Brazil.

ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN BRAZIL: CURRENT STATUS

The adoption and implementation of Artificial Intelligence (AI) technologies in the Brazilian public sector represent a crucial step towards the modernization and optimization of the services offered to citizens. While AI offers significant promises for transformation in essential areas such as health, education, and security, it also faces a set of challenges that are critical to the success of its integration into the country's public administrations (Ferreira & Oliveira, 2022).

Analysis of the Development and Implementation of AI Technologies in the Brazilian Public Sector

The implementation of Artificial Intelligence (AI) technologies in the Brazilian public sector is in a phase of significant growth, marked by both innovative advances and considerable challenges. This evolution is driven by the need to modernize public services, aiming at greater efficiency and responsiveness to the demands of the population. In Brazil, several AI projects are being developed to address health, education, and security issues. In healthcare, for example, AI-based systems are being tested to improve triage and diagnostics in hospitals, reducing wait times and increasing the accuracy of treatments offered to patients. In education, adaptive learning programs are being used to personalize teaching, improving student performance in various regions of the country.

Challenges and Progress in the Adoption of AI in Brazilian Public Administrations

Challenges:

- **Technology Infrastructure:** The lack of a robust infrastructure is one of the main obstacles, limiting the ability to implement AI solutions on a large scale. The need for infrastructural improvements and advanced technological resources is crucial for the advancement of AI in the public sector (Silva & Costa, 2020a).
- **Professional Training:** There is an urgent need to train skilled professionals who can develop, implement, and maintain AI systems. Human resource training is key to maximizing the potential of AI technologies in Brazil (Silva & Costa, 2020a).
- **Ethical and Privacy Issues:** Concerns about data privacy and the ethical use of AI are significant, requiring clear and stringent policies to regulate its application. Such issues require a careful approach to ensure compliance with ethical and legal standards (Mendes & Ferreira, 2019a).

Progress:

- **Development Policies:** The Brazilian government has encouraged the use of AI through funding policies and partnerships with research institutions and universities, seeking to strengthen the development and application of AI in the public sector (Barros & Oliveira, 2021a).
- **International Collaborations:** Collaborative initiatives with countries that are leaders in AI are helping to transfer knowledge and technology to Brazil, enriching the national technological ecosystem and opening new frontiers for public innovation (Gomes & Lima, 2022a).
- **Pilot Projects:** Several pilot projects demonstrate the potential of AI to transform the public sector, offering concrete evidence of the benefits of this technology. Carvalho and Neto (2020b) present a series of success stories that illustrate the transformative potential of AI in Brazil.

Table 2: Challenges and Progress in the Implementation of AI in the Brazilian Public Sector

Aspect	Challenges	Progress
Infrastructure	Lack of advanced technological resources	Investment in technological improvements
Training	Shortage of skilled professionals	Capacity building and continuing education programs
Ethics & Privacy	Concerns about the protection of personal data	Development of specific regulations and laws

Source: Prepared by the author (2024)

Table 2 offers a balanced view of the challenges and progress in the implementation of AI in the Brazilian public sector, suggesting that while there are significant obstacles, there are also clear

opportunities to advance the adoption of this technology. Each identified challenge necessitates specific strategies to overcome, including infrastructure improvements, regulatory clarification, and educational efforts. At the same time, progress indicates a promising trajectory, in which continued engagement with cutting-edge technologies could significantly improve the efficiency and quality of public services in Brazil.

COMPARISON BETWEEN INTERNATIONAL AND NATIONAL INITIATIVES

This subchapter is dedicated to a detailed comparative analysis between the implementations of Artificial Intelligence (AI) technologies in the public sector in different countries and the current scenario in Brazil. By examining how nations with advanced AI systems have applied these technologies to improve the efficiency and effectiveness of public services, we can draw valuable lessons and identify exemplary practices that could be adapted and adopted in the Brazilian context.

Detailed Comparison of International Cases with the Brazilian Scenario

The global advancement of Artificial Intelligence (AI) technologies in the public sector reveals a marked contrast to the progress seen in Brazil. Countries such as the United States, Japan, and Germany have been implementing AI extensively to optimize public services, from health to security to education. For example, in the United States, AI is used to improve energy efficiency in public buildings, while in Japan, AI technologies assist in monitoring and caring for the elderly, a critical service given the aging population (Smith, 2020; Yamada, 2021).

In Brazil, despite promising initiatives, AI implementation still faces substantial infrastructure and regulatory challenges, which slow its comparative development. A notable example is the use of AI in public health for diagnosis and treatment management, which, although growing, still does not reach the efficacy observed in more advanced countries (Costa & Silva, 2019).

Assessing the Adaptability and Effectiveness of Global AI Technologies in Brazil

The adaptability of global AI technologies in the Brazilian context requires careful analysis. Factors such as cultural, economic, and technological infrastructure differences play significant roles. For example, while AI systems that support medical diagnoses in European hospitals are highly effective, their implementation in Brazil requires significant adaptations to address the diversity of data and the variability of local health conditions (Mendes & Ferreira, 2021).

In addition, the effectiveness of these technologies is often limited by the ability to integrate with legacy systems and the need for technical training of Brazilian professionals to operate and maintain these advanced systems (Barros & Oliveira, 2021a).

Table 3: Comparative Implementation of AI in the Public Sector

Country	Sector	AI Technology	Noted Efficiency	Necessary Adaptation in Brazil
USA	Energy	Energy optimisation	Discharge	Moderate
Japan	Care of the Elderly	Health monitoring	Discharge	Significant
Brazil	Health	Automated Medical Diagnosis	Moderate	Discharge

Source: Prepared by the author (2024)

Table 3 provides a useful insight into how different countries are applying AI technologies in specific sectors of the public service and what is the need for adaptation to implement these technologies in Brazil. This analysis highlights both the effective strategies and the specific challenges associated with adapting global solutions to local Brazilian conditions.

BARRIERS AND OPPORTUNITIES FOR THE IMPLEMENTATION OF AI IN BRAZIL

This subchapter examines the challenges and possibilities that emerge in the journey of adopting Artificial Intelligence (AI) technologies in the Brazilian public sector. While AI has revolutionary potential to transform government services, its effective implementation is hampered by a number of technical, legal, and cultural barriers that need to be carefully managed. At the same time, there are significant opportunities that, if seized, can not only overcome these obstacles but also catalyze innovation and continuous improvement in public services.

Discussion of the Main Technical, Legal and Cultural Barriers

The implementation of Artificial Intelligence (AI) technologies in the Brazilian public sector encounters several barriers that can hinder their development and effectiveness.

- **Technical Barriers:** Insufficient technological infrastructure is one of the biggest limitations. Many public institutions lack the necessary hardware and software to support advanced AI systems, which may hinder the adoption of these technologies on a large scale (Silva & Costa, 2020b).
- **Legal Barriers:** On the legal side, Brazil is still developing a regulatory framework that adequately addresses the data privacy and ethics issues associated with the use of AI. The lack of specific legislation can lead to challenges in the implementation of technologies that are essential for the digital transformation of the public sector (Mendes & Ferreira, 2019b).
- **Cultural Barriers:** Culturally, there is significant resistance to change among civil servants, many of whom may see AI as a threat to their jobs rather than a tool to increase the efficiency and effectiveness of services (Barros & Oliveira, 2021a).

Opportunities for the Expansion and Improvement of AI in the Brazilian Public Sector

Despite the barriers, there are significant opportunities for the expansion and improvement of AI in the Brazilian public sector:

- **Innovation in Public Services:** AI can be used to innovate and improve public services, especially in areas such as healthcare, education, and security, where the analysis of large volumes of data can help optimize resources and offer tailored solutions (Gomes & Lima, 2022b).
- **Technology Promotion Policies:** The government has the opportunity to create development policies that encourage research and development in AI, as well as collaborations with the private and academic sectors, to accelerate the adoption of this technology in the public sector (Carvalho & Neto, 2020a).
- **Capacity Building and Education:** Investing in training public servants to work with AI is essential. Training programs can help reduce cultural resistance to technology and prepare the workforce for the digital economy (Santos & Rocha, 2021).

Table 4: Barriers and Opportunities for AI Implementation in the Brazilian Public Sector

Category	Barriers	Opportunities
Technique	Insufficient infrastructure	Innovation in public services
Legal	Lack of specific regulation	Policies to promote technology
Cultural	Resistance to change	Capacity building and education

Source: Prepared by the author (2024)

Table 4 provides a structured overview of the main challenges and potential advances associated with the use of Artificial Intelligence (AI) in government institutions in Brazil. This analysis makes it easy to understand the measures needed to overcome obstacles and maximize the benefits of technology in various public sectors.

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON STRATEGIC PLANNING AND PUBLIC POLICY FORMULATION IN BRAZIL

This Section is dedicated to exploring the profound impact that Artificial Intelligence (AI) is beginning to have on strategic planning and public policy formulation in Brazil. The growing incorporation of AI in the public sector promises to radically transform the way services are delivered and policies are developed, providing unprecedented opportunities to increase efficiency, transparency, and innovation in government operations.

IMPACT OF ARTIFICIAL INTELLIGENCE ON THE PUBLIC SECTOR

Artificial Intelligence (AI) is becoming a transformative force within the public sector, fundamentally altering government operations and strategic planning. As this technology advances,



its integration into various government areas promises to increase efficiency, accuracy, and responsiveness to citizen demands.

The Growing Role of AI in Government

The adoption of AI in government is not just a technological trend, but a necessary evolution to address complex contemporary challenges. Governments around the world are exploring how AI can be used to optimize services, from streamlining bureaucratic processes to improving the delivery of health and education services. In addition, AI offers unprecedented capabilities in analyzing large volumes of data, allowing for more informed and strategic decision-making (Silva & Rocha, 2020).

Benefits of AI in Government Operations

Implementing AI in government operations offers a range of benefits, including automating tasks, optimizing resources, and a better understanding of population needs. For example, AI-based systems that manage traffic data can help improve urban mobility, while machine learning algorithms are able to identify fraud patterns in public financial services, increasing transparency and security.

Challenges in Implementing AI

However, the implementation of AI in the public sector also faces significant challenges. Issues such as data privacy, cybersecurity, and ethics in the use of algorithms are concerns that need to be carefully managed. In addition, there is the challenge of public acceptance and training of employees to work with new technologies, which are crucial for the successful integration of AI (Costa & Lima, 2021).

IMPROVED EFFICIENCY THROUGH AI

The adoption of Artificial Intelligence (AI) technologies in the public sector has proven to be a powerful lever for the optimization of government processes. This subchapter explores how AI is contributing to increasing operational efficiency, reducing costs, and improving resource allocation in various areas of public administration, providing concrete examples and relevant case studies.

Increased Operational Efficiency

Implementing AI can automate bureaucratic processes that traditionally require hours of manual labor, allowing public officials to focus on higher-value tasks. For example, AI systems that automate data entry and document processing have been successfully implemented in government departments, reducing errors and increasing processing speed (Silva & Costa, 2020a).



Cost Reduction

AI also offers significant potential for cost savings. Predictive algorithms can be used to optimize the use of resources in industries such as healthcare and public transportation. In the healthcare sector, for example, AI has been used to predict peaks in demand in hospitals, allowing for more efficient management of personnel and equipment, which results in substantial savings (Carvalho & Neto, 2020b).

Improved Resource Allocation

In addition to increasing efficiency and reducing costs, AI can improve resource allocation by allowing for a more accurate analysis of the population's needs. AI systems that analyze patterns of public service use can help governments allocate resources more effectively, ensuring that areas of greatest need receive adequate attention (Costa & Silva, 2019).

CHALLENGES AND BARRIERS IN THE IMPLEMENTATION OF AI IN BRAZILIAN PUBLIC MANAGEMENT

The integration of Artificial Intelligence (AI) in the Brazilian public sector presents challenges that need to be addressed to ensure the effectiveness and sustainability of the adoption of this technology. This chapter discusses the main technical, legal, and cultural barriers, as well as strategies for overcoming them.

TECHNICAL BARRIERS

The lack of adequate technological infrastructure is one of the biggest technical obstacles to the effective implementation of AI. Many public institutions still lack the necessary hardware, high-speed internet connections, and secure and efficient data storage capabilities to support AI-based systems. In addition, the shortage of qualified professionals to develop and manage these systems further complicates the situation (Silva & Costa, 2020b).

LEGAL BARRIERS

On the legal side, Brazil is still working to create a regulatory framework that adequately supports the use of AI. Issues of data privacy, ethical use of AI, and transparency in automated decision-making are all areas that need clear and robust legislation to ensure that citizens' rights are protected while benefiting from the advantages of technology (Mendes & Ferreira, 2019a).



CULTURAL BARRIERS

Culturally, there is significant resistance to the adoption of disruptive technologies such as AI. This can be attributed to fear of job loss among public sector workers and the public's distrust of decisions made by machines, especially in sensitive areas such as justice and public safety. The lack of understanding about how AI works and its benefits contributes to this resistance (Barros & Oliveira, 2021a).

STRATEGIES FOR OVERCOMING CHALLENGES

To overcome these barriers, it is essential to invest in technological infrastructure, staff training, and public awareness campaigns to educate both employees and the general population about the benefits of AI. In addition, the development of a strong and clear legal framework is crucial to ensure trust and acceptance of the technology (Ferreira & Oliveira, 2022).

FINAL THOUGHTS

This study investigated the integration of Artificial Intelligence (AI) in Brazilian public management, analyzing the challenges and opportunities to increase government efficiency. The main findings indicate that AI has enormous potential to transform public management, providing greater efficiency, transparency, and innovation. However, the effective implementation of AI faces significant challenges, including inadequate infrastructure, a lack of quality data, regulatory challenges, and ethical concerns.

It is highlighted that while AI can significantly improve efficiency, transparency, and innovation in government processes, its implementation faces notable obstacles. We have identified that the effective adoption of AI requires not only the enhancement of technological infrastructure and the training of personnel, but also the development of a robust legal framework and ethical policies that ensure the responsible use of the technology. In addition, the study shows that it is crucial to establish clear regulations and governance mechanisms to overcome these challenges, ensuring that AI is used ethically and that it contributes positively to public administration.

The practical implications of this study suggest that public managers should invest in robust technological infrastructure and staff training to maximize the benefits of AI. Creating a clear regulatory framework and robust ethical policies are essential to ensure the responsible use of AI. Theoretically, the results contribute to the existing body of knowledge on the application of AI in public management, offering insights into how this technology can be integrated effectively and ethically. The research shows that AI can serve as a powerful tool to modernize and improve the efficiency of the public sector, provided that the associated challenges are managed appropriately.



This study has some limitations. The dependence on secondary data may have influenced the results, and the lack of generalization of the findings to contexts other than the Brazilian one is a limitation to be considered. In addition, regional variations within Brazil may not have been completely captured, which could affect the applicability of the results in all regions of the country. Future studies could include a more quantitative approach and specific case studies to validate the results presented here.

For future research, it is recommended to explore international AI integration strategies as benchmarking to improve Brazilian legislation. Longitudinal studies evaluating the long-term impact of AI on public management are needed to provide deeper insights into the benefits and challenges of this technology. Additionally, research exploring the interaction between different levels of government and AI adoption can reveal important dynamics for a more cohesive and efficient implementation.


In conclusion, the adoption of AI, if implemented responsibly and strategically, can be a powerful lever for the modernization and efficiency of the Brazilian public sector, improving the quality of services offered to citizens and strengthening government transparency and accountability. This study contributes significantly to the scholarly literature, providing a solid foundation for future research and policy at the intersection of AI and public management. The proposed strategies and insights offered can guide public decision-makers in the effective implementation of AI technologies, ensuring that technological innovation is aligned with ethical principles and societal needs.



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The work of nurses in rural primary health care in Montes Claros, Minas Gerais, Brazil

 <https://doi.org/10.56238/sevned2024.014-010>

Camilla dos Santos Souza¹, Jair Almeida Carneiro², Danielle Ladeia Santos³, Beatriz Efigênia Nogueira Machado Gomes⁴, Meriele Santos Souza⁵, Julia Maria Gonçalves de Almeida⁶, Wivian Mariana Fonseca Soares⁷, Fernanda Marques da Costa⁸, Diego Ranieri Alves⁹ and Jessica Camila Santos Silveira¹⁰

ABSTRACT

The concentration of health services in urban areas results in difficulties in providing health care to populations living in rural areas. Several factors are identified as hindering access to health, such as investment in public health policies for rural populations and improvement of infrastructure for Primary Health Care (PHC). Considering the importance of the role of nurses in Brazilian PHC, as well as their constant presence in rural areas, this study aims to evaluate the working conditions of these professionals in rural areas. **METHODS:** An exploratory and descriptive research method was adopted, following a qualitative approach. A semi-structured research guide was used in two sections, divided into sociodemographic characterization and open questions about the work performed in rural PHC in the municipality of Montes Claros, Minas Gerais. Seven professionals participated in the study, with a variation in working time in rural PHC from 1 year and 10 months to 11 years. The interviews were authorized by the Municipal Health Department, and were conducted in accordance with the norms of Resolution No. 466/2012 of the National Health Council. This study was authorized by the Research Ethics Committee of the State University of Montes Claros (UNIMONTES) under opinion no. 6.320.218. **RESULTS AND DISCUSSION:** The analysis of the work performed by rural PHC nurses made it possible to organize the findings into topics such as the characterization of the sociodemographic and

¹ Nurse Specialist in Family Health, Master's student in the Graduate Program in Primary Health Care. State University of Montes Claros (UNIMONTES).

E-mail: camyllasouza19@yahoo.com.br

² Dr. in Health Sciences

State University of Montes Claros (UNIMONTES).

E-mail: jair.carneiro@unimontes.br

³ Nurse Specialist in Family Health, Master's student in the Graduate Program in Primary Health Care.

State University of Montes Claros (UNIMONTES).

E-mail: dladeia99@gmail.com

⁴ Nurse, Master's student in the Graduate Program in Primary Health Care.

State University of Montes Claros (UNIMONTES).

E-mail: beatrizenogueira09@gmail.com

⁵ Nurse, Master's student in the Graduate Program in Primary Health Care.

State University of Montes Claros (UNIMONTES).

E-mail: meriele.apoiadora@gmail.com

⁶ Dental Surgeon, Master's student in the Graduate Program in Primary Health Care.

State University of Montes Claros (UNIMONTES).

E-mail: almeida.juliag@gmail.com

⁷ Nurse.

State University of Montes Claros (UNIMONTES).

E-mail: wivianmariana@gmail.com

⁸ Dr. in Health Sciences

State University of Montes Claros (UNIMONTES).

E-mail: fernanda.costa@unimontes.br

⁹ Resident Physician in Family Health.

State University of Montes Claros (UNIMONTES).

E-mail: diegoranierialves@gmail.com

¹⁰ Dental Surgeon, Master's student in the Graduate Program in Primary Health Care.

State University of Montes Claros (UNIMONTES).

E-mail: jessica.dentista14@gmail.com



professional profile of nurses, the relationship between public rural health policies and the working conditions offered, nurses' daily lives, revealing dichotomies related to work, associations of the life context and health situation of rural and forest populations, in addition to the Family Health Strategy as the only means of access to health. Through this work, it was possible to understand the true meaning of work, revealing a strong influence of work on the quality of life of the professionals themselves. **CONCLUSION:** Through this study, it was possible to conclude that the work performed by nursing professionals is extremely relevant for the continuity of care offered by PHC. The nurses interviewed revealed that they face adversities in the exercise of their work, such as facing unfavorable conditions when driving to the workplace, such as the weather, difficult access roads, lack of adequate means of transportation, in addition to the poor infrastructure of the places of care and difficulties in communicating with health management, according to the findings of the literature. However, the meaning of the nurse's work is based on the satisfaction of the population, attributing sentimentality to the nursing practice, based on care and health promotion.

Keywords: Rural health, Primary Health Care, Nursing.

INTRODUCTION

The "rural world" is a socio-productive space, historically occupied by the Brazilian population, who through agriculture and livestock led the national economy (Gonçalves and Otte, 2019). However, it was only in the second half of the twentieth century that it was overtaken by the commercial and industrial activities of large urban centers (Navarro, 2019). There are several obstacles to achieving full access to services in these remote regions, such as political and geographic isolation, lack of accessibility, financial limitations, lack of planning, ineffective public health policies, among others (Brasil, 2023; Franco, Lima and Giovanella, 2021).

The concentration of health services in large urban centers results in greater difficulty in accessing health care for those individuals living in rural areas, resulting in a higher incidence of potentially preventable diseases, leading to public health problems (Bousquat *et al.* 2022). The impossibility of locomotion appears in the literature as the main factor in distancing the rural population from the health care network (Soares *et al.*, 2020).

Access to health care in rural communities depends on several factors, both governmental and population and/or territory. There are several ways to achieve the provision of health to the wealthiest populations, one of them is through the consolidation of Primary Health Care (PHC), the basis of the Unified Health System (SUS) (Bousquat *et al.* 2022; Franco, Lima and Giovanella, 2021). PHC, through professionals and care projects, aims to ensure access to and promotion of health throughout the national territory. Home visits, in turn, are the most effective means of providing care to hard-to-reach communities (Soares *et al.* 2020).

The territory is a factor that hinders universal access to health, as well as the scarcity of resources and professionals, such as doctors and nurses (Bousquat *et al.* 2022). Such problems generate an overload of the current health system and workers in the area, forming obstacles to the promotion of continuous, comprehensive care, assistance to small and large emergencies, evidencing the need for the presence of health care centers in regions farther from urban centers (Franco, Lima and Giovanella, 2021).

It is evident that the nursing team provides more care to the rural population when compared to medical professionals. Even in the face of salary, contractual and professional devaluation, nurses working in PHC establish greater bonds and care for rural populations (Fausto *et al.* 2023). Members of family health teams reveal that they need more time spent in more remote areas to comply with the comprehensiveness and problem-solving capacity of care (Oliveira *et al.*, 2020).

In view of the relevant care role provided by PHC nurses in rural areas, this study aims to evaluate the working conditions offered in these areas, discussing the means that facilitate and hinder the work process and care coordination. In this context, by enabling the knowledge and qualification

of nurses in rural areas, the level of health care in non-urban communities can be classified (Oliveira *et al.* 2022).

METHODS

To achieve the proposed objective, the exploratory and descriptive research method with a qualitative approach was adopted. The qualitative methodology allows the researcher to adopt a systemic view of the problem under study, revealing the essences of social processes, enabling the understanding of the meanings and beliefs of the subjects (González, 2020).

This study was carried out in rural primary health care in the city of Montes Claros, located in the state of Minas Gerais, Brazil. In the last census conducted in 2022 by the Brazilian Institute of Geography and Statistics (IBGE), the municipality had 414,240 inhabitants, concentrating the majority of the population between 20 and 59 years of age (IBGE, 2022). Rural PHC has 11 Family Health Units (FHUs), while urban PHC has 80 FHUs, totaling 91 health care points in Montesclarenses territory.

Nurses working in the rural service for a period of more than six months participated in this study. Of the total of 11 nurses who provided care in all 11 rural FHUs, 7 made up the final sample. Of the 7 participating professionals, 5 were women. The length of time working in rural PHC ranged from 1 year and 10 months to 11 years, in addition, only one male professional reported not having a postgraduate degree in the health area.

The data presented in this research come from a qualitative data collection, a method that contributes to the understanding of the existing interactions about the phenomenon studied in a broad way, especially in the area of health (González, 2020; Pinto, Campos and Siqueira, 2018).

A semi-structured research guide was constructed, organized into two sections: the first corresponded to the sociodemographic characterization of the interviewed professionals; the second session was structured with open questions about the work performed in rural PHC.

The collected data were treated according to the Content Analysis (CA) method, understood as the search for the meaning of a document. In this way, CA describes the content considering all its explicit content, in addition to its subtext (Campos, 2004). Thus, the findings were divided by theme, and discussed based on the evidence in the literature.

The interviews were authorized by the Municipal Health Department (SMS), took place in a previously scheduled manner and carried out at the SMS headquarters, from November to December 2023. The study was carried out in accordance with the norms 466/2012 of the National Health Council, which provides for research involving human beings, in addition to being approved by the Research Ethics Committee of the State University of Montes Claros – UNIMONTES, under opinion number 6.320.218.

RESULTS AND DISCUSSION

For the organization and analysis of the work performed by rural PHC nurses, the results and discussions will be presented in topics, making it possible to objectively characterize the findings resulting from this research and the evidence found in the scientific literature.

SOCIODEMOGRAPHIC PROFILE AND SAMPLE CHARACTERIZATION

To describe the sociodemographic characterization of the study participants, criteria such as age, sex, marital status, number of children, according to the **Table 1**. Occupational characteristics were described in the **Table 2**, such as time since graduation, post-graduation, time working in rural PHC, type of employment relationship, and other work activities.

Of the group of seven participants, five were female. The participants' ages ranged from 36 to 47 years, with four professionals single, two married, and one divorced. The time since graduation ranged from 5 to 18 years, however, the time of work in rural PHC was shorter, ranging from 1 year and 10 months to 11 years. Most of the interviewees reported a contractual relationship with the SMS, and only one nurse had a statutory relationship.

Regarding complementary education, only one nurse reported no post-graduate degree, while the other participants had complementary training in several areas, with a predominance of specialization in Family Health by six participants. Other areas of specialization reported were Obstetric Nursing, Management, Occupational Health, Public Health, and Urgency and Emergency.

The characterization allows us to conclude that the nurses working in rural Primary Care in Montes Claros have adequate levels of qualification, professional experience and appreciation for their work. However, although they are properly qualified, the professionals report dichotomies that exist in the exercise of work in rural areas, such as the lack of continuing education for professionals.

"...I like it a lot... To work in the rural area, we have to have a profile, we have to like what we do, because there are many difficulties, it's a completely different job... I miss, for example, guidance, training of professionals, especially in relation to the greater demand for care in rural areas, such as accidents with animals, use of pesticides, in short, total health... Things that we know would be very important, even if we have a residency in Family Health. We see a different dynamic in the rural area... some way to train these professionals, because even though they have the profile of enjoying this involvement with the community... We also need training to be able to better serve this population, which is very differentiated..." (Nurse 4).

Table 1: Sociodemographic characterization of rural PHC nurses in Montes Claros, MG, Brazil, in 2023.

Participant	Age	Gender	Marital status	Offspring
Nurse 1	39	M	Single	0
Nurse 2	47	F	Single	1
Nurse 3	36	M	Single	0
Nurse 4	44	F	Divorced	2
Nurse 5	41	F	Single	0
Nurse 6	39	F	Married	1
Nurse 7	42	F	Married	1

Source: Researcher, 2024. / F: female; M: male.

Other studies that aim to identify the professional profiles working in rural areas of Brazil confirm the prevalence of actions performed by nurses in rural areas. A study carried out in the state of Amazonas found that 83% of the nursing professionals working in rural PHC in Amazonas were female, aged between 29 and 40 years. Regarding specialization, only 2.5% did not have a residency, 46.9% had a postgraduate degree, and 15.4% in family health (Dolzane and Schweickardt, 2020).

On the other hand, a study carried out in the state of Pará sought to identify the specificities of PHC in 5 municipalities in the west of the state, where the majority of the population lives in rural areas, verifying the prevalence of nursing professionals with a contractual relationship, similar to the findings of this research (Lima *et al.* 2023).

Table 2: Characterization of the occupation and title of rural PHC nurses in Montes Claros, MG, in 2023.

Training Time (years)	Postgraduate studies	Time in rural PHC	Link	Other occupations
12	SF/Obstetrics	11 years	Contractual	No
12	SF/Management	2 years	Contractual	No
13	No	1 year and 10 months	Contractual	No
18	SF	10 years	Statutory	No
17	SF	5 years	Contractual	No
5	SF and ST	5 years	Contractual	No
14	SF/SP/Urg. e Emerg.	2 years and 7 months	Contractual	No

Source: Researcher, 2024. / FH: Family Health; TS: Occupational Health; SP: Public Health.

PUBLIC POLICIES ON RURAL HEALTH AND WORKING CONDITIONS

Brazil is characterized by a great diversity of races, ethnicities, peoples, religions, cultures, social and economic activities. Most of Brazil's production is found in rural areas, such as agriculture, cattle ranching and extractive activities. The north of the state of Minas Gerais is in a



region of transition of biomes, from the cerrado to the caatinga. The area is home to diverse peoples, such as quilombolas, riverine communities, indigenous peoples, rural peoples and forest (Brasil, 2013).

In 2011, the Ministry of Health presented the National Policy for the Comprehensive Health of Rural and Forest Populations, PNSIPCF, through Ordinance No. 2,866, of December 2, 2011, with the purpose of meeting the health care needs of the most remote populations. Prior to that, Ordinance No. 2,460 of December 12, 2005 instituted, through the Earth Group, a draft of the care for these populations (Brasil, 2013).

"...The working conditions are very difficult, because we have to adapt, we are thirsty because we don't have a stretcher, we don't have an adequate table, bathrooms, we don't have all that support to care for the patient, so the rural area is totally different, I think that as was said earlier, even the professionals have to have the profile, because it's really hard..." (Nurse 1).

The PNSIPCF aims to meet, according to the Brazilian rural reality, respecting the economic, political and cultural history, considering the suffering and particularities of the populations, the fragile health conditions, aiming to reduce health inequities, reducing diseases that are precursors of morbidity and mortality rates. The Brazilian policy had groups representing government agencies, social movements and guests for its elaboration, enabling social and governmental dialogue to achieve health demands (Brasil, 2013).

"... I realize that there are many demands, many demands that they want to charge just like here, in the urban area, for few working conditions... Yesterday, for example, it rained and there was a power outage, they kept asking me for a schedule, but I was unable to send because I didn't have power..." (Nurse 2).

A study carried out with the objective of comparing the demand for health services among elderly people living in urban and rural regions showed that those living in urban areas use health services more frequently. Several factors contribute to the drop in the search for health services, making it possible to identify conditions that interfere with the quality of life of rural populations, such as difficulty in accessing healthcare, waiting time for care, lack of vacancies for care, lack of professionals and resources, among others (Alves, Parente and Herkrath, 2024).

In this context of great difficulties in promoting access to health services, the PNSIPCF acts dependently on the SUS and the other institutions that are part of it, revealing the need for a commitment between the operationalization of the Brazilian health system, at the federal, state and municipal levels, and social control. In this way, health care for rural populations is based on the organization, planning, and articulation of services, improving the Federative Pact for Health, responsible for guaranteeing the right to health of Brazilians (Brasil, 2013; Pase, Patella, and Santos, 2023).



In this sense, the nurses reported facing difficulties and precarious conditions for working with the Family Health Strategy (FHS) in the rural environment.

"Quite precarious. When care is provided in nearby communities, or even far away, we will always be in a place that is not suitable for the correct care, whether for personal care, patient anamnesis... Sometimes the place is open and everyone listens to what is said... Sometimes to carry out prenatal care, prevention... That complicates it a lot. These are associations, deactivated schools that we end up attending. Outlying communities that we end up serving. Poor hygienic conditions, physical structure, a bit complicated." (Nurse 3).

LIFE CONTEXT AND HEALTH SITUATION OF RURAL AND FOREST POPULATIONS

Brazil is located in a region with an important energy strategy, food security, a major producer of oil and mineral extraction, becoming an important scenario for the economic investment of major world powers, such as China. However, even with several economic advances, Brazil presents inequalities in the distribution of its wealth, significantly affecting the national population by more than 30%. Several indicators are evidence of the inequity faced by the country, which is reflected in the national economic structure, labor market, living conditions, housing, health, and education (Busilli and Jaime, 2021; IBGE, 2023).

According to the latest National Health Survey, conducted in 2019, the percentage of people who rated their health situation as "bad or very bad" reached 7.8%, with urban 5.2%. Meanwhile, those who rated their own health as "good or very good" reached only 55.2%; The urban population reached 68%. The percentages remain low for the rural population when it comes to the indicator of "medical consultation in the last 12 months", reaching only 68.6%, when rural populations reach 77.5% (Brasil, 2019).

The PNSIPCF expands the meaning of poverty, including the absence of opportunities and conditions of access to essential goods for the provision of health, vulnerability to the lack of opportunities and possibilities, as evidenced in the lack of jobs, decent housing, food, basic sanitation, lack of health and education services, situations of violence, in addition to the lack of social participation. The policy then brings to light the social determinants of health, which are important indicators of quality of life (Brasil, 2013).

The model of capital accumulation advocated by capitalism, present in Latin America, foresees the extraction of wealth, especially in Brazil, a country of extensive geography, diversity and labor. In this model of agribusiness expansion, there are gaps in the health of rural populations, who suffer from the abuses of large landowners, agricultural modernization and precarious health, implying several insecurities in their work, such as water and food, soil degradation, air pollution, among others (Brasil, 2013; Pontes, Silva and Silva, 2023).

From the perspective presented by the authors, it is possible to identify factors that contribute to the poor quality of life of rural and forest populations, showing that physical and environmental



exposure to pesticides causes poisoning and disturbances in several biological systems, increasing the incidence of cancer and precancerous alterations, increasing morbidity and mortality rates in this population (Brasil, 2013; Pontes, Silva and Silva, 2023).

"It is a population that is very lacking in everything, financial resources, studies, there are difficulties in access, so for them it is very gratifying when we are able to provide quality care." (Nurse 4).

The existence of significant numbers of underreporting of diseases proves the existing difficulty for access to health in rural populations, such as schistosomiasis, which persists in territories of social vulnerability, poor socio-sanitary conditions and lack of effective care. The morbidity of the rural population indicates a higher number of individuals with symptoms of diarrhea, vomiting and pain in limbs, associating rural areas with a higher occurrence of gastrointestinal symptoms (Brasil, 2013; Feitosa, Meireles and Lara, 2021).

"And we talk about neglected diseases that are very common in rural areas, but the population is neglected due to issues of precariousness of roads, housing, it is a more neglected population in this sense..." (Nurse 4).

Violence in rural areas is present and often exacerbated, since there is no mediation for conflicts. Violence over land and property disputes, domestic and sexual violence against women are the main demands. Rural populations, mostly female, report episodes of physical, psychological, moral, sexual, patrimonial violence and private imprisonment. The Southeast region ranks second in violence against women living in rural areas in the country (Brasil, 2013; Stochero and Pinto, 2024).

THE FHS AS THE ONLY MEANS OF ACCESS TO HEALTH

The creation of the Unified Health System and its implementation and organization made it possible to expand access to health to the entire Brazilian population, in an equitable and egalitarian manner. From this perspective, the Family Health Strategy acts as a model for the application of the system's doctrinal and organizational principles, recognizing the needs of the population. The formulation of public health policies, such as the PNSIPCF, aims to assist the provision of health care to rural communities (Brasil, 2013).

"We have a great response when we see that patients come to us as a reference, as said, we see that it is a certain recognition of what we are developing and working on. Always trying to help the patient, solve the problem so that he doesn't go home without a more reliable and correct answer..." (Nurse 3).

It is common to observe in rural populations the use of traditional knowledge and practices to solve health problems, so popular knowledge is passed down through generations and put into practice in many rural communities. In this regard, the Brazilian health model is still based on the



model of meeting spontaneous demands, a factor that has been altered according to professional updates and working conditions (Gomes *et al.* 2024).

"There's something I would change, that I think... What happens... We have a community with a very large population, with more than six thousand inhabitants, and our unit has a very large spontaneous demand, so all that is needed, and what I would change, is to have a doctor just to meet this spontaneous demand." (Nurse 1).

As well as reporting diseases, the FHS works as support for the prevention and protection of people suffering from domestic violence. The population's access to health services requires continuity in planning, implementation, and monitoring of actions, aiming to provide health in a qualified and comprehensive way (Brasil, 2013; Stochero and Pinto, 2024).

A Basic Health Unit is considered to be a place with a complete family health team, however, there are frequent complaints about the lack of doctors in the interior UBS. Nursing care is present in all units of rural PHC in Montesclar, working in nursing consultations, spontaneous demand care, management and emergency care (Lima *et al.* 2023). Nurses working in primary care perceive the work as extremely relevant, seeking to solve problems with the demands of the rural population:

"I think it's very important because of the issue of problem-solving, of the population's access, because as we serve the population in rural areas, it is very difficult sometimes for them to have access to services, such as vaccination every day, collection of materials for exams, which makes it much easier for them to have this type of service in the communities." (Nurse 4).

A study of rural PHC reveals the importance of professional nurses for the provision of health care to the population living in areas of difficult access, evidencing the wide scope of health-related practices in rural areas. Nurses perform day-to-day health monitoring of people with comorbidities and chronic diseases, as well as prenatal consultations for low-risk pregnant women (Lima *et al.* 2023).

"... I arrive at the unit, make appointments, do triages and then I go to perform the scheduled appointments. There goes everything, childcare, prevention, prenatal care, or any demand that the patient wants to talk to me about. We take a break for lunch, which is from noon to an hour... He is also hampered by having to speed up the services in the afternoon. I arrive at the Secretariat, clock in and close the workday." (Nurse 5).

The professionals interviewed frequently highlighted the importance of the activities performed by the Community Health Agents for the success of the FHS in rural territory. The frequent presence of CHWs in the areas served helps to strengthen and bring FHTs closer to the community, maintaining the link between users and the local health service (Lima *et al.* 2023).

DAILY LIFE OF RURAL FHS NURSES

Nurses play a key role in PHC, since their performance must be balanced, available, productive, problem-solving and competent. Nurses work according to nursing processes, allied to nursing practices, aim to achieve excellence in care management using evidence-based nursing; domain in health promotion and prevention, research incentive, and leadership (Cassiani *et al.* 2018; Miranda-Neto *et al.* 2018).

The functions performed by nurses are one of the pillars of Brazilian PHC, integrating most of the functions performed by the FHS, both in the provision of care services and in the administrative part. Common to national primary care, nurses perform territorialization, an important factor in socio-sanitary diagnosis and conditioning factors, essential for the implementation of health practices and actions that promote the health of the population (Toso *et al.* 2021).

"My day-to-day life is a bit busy, because every day we are in a different place, and my unit has its own headquarters, where we stay three days a week and go out one day to the countryside. So, we have to have logistics and flexibility to serve the patient in a humanized way. It's totally different from the urban area, because sometimes we make schedules and schedules, which – he laments – immediately have to change them." (Nurse 1).

Seeking to increase adherence to health services, nurses rely on health promotion, prevention and protection practices, which are also included in the scope of nursing practices, assuming the role of educator in addition to being caregiver and manager. In addition to continuing education for health professionals, nurses carry out health education practices aimed at the population, with the aim of promoting knowledge, autonomy and self-care, preventing risks and protecting health (Falcão *et al.* 2023).

"The importance of my work as a nurse is that we are able to help the community, in bringing prevention and health promotion care, things that in the communities leave something to be desired, because sometimes they go a long time without medical care, you know..." (Nurse 2).

The difficulty in establishing a continuity of health care services for this population is due to the levels of exclusion and discrimination, justified by the lack of consolidation and effectiveness of public policies and misinformation, since the demands that arise in rural areas are mostly of urgency. This fact justifies the need for continued care for these populations (Rodrigues *et al.* 2021).

THE TRUE MEANING OF WORK

Work has historical importance in people's lives, becoming inseparable from the individual's personality, criterion of value and self-perception, it is one of the indicators of quality of life (Sousa-Filho *et al.* 2022). In the course of the development of the work, various feelings such as pleasure or suffering can influence interpersonal situations and relationships (Franco *et al.* 2021).

The qualitative approach employed in this study allows us to collect information about the perception of the work performed¹⁰ in PHC, which is a factor of strong influence for the maintenance of the quality of life of the professionals themselves. From the questioning about the perception of the meaning of work, the professionals point out several factors, such as sentimentality, problem-solving, social relationships, satisfaction, among others.

"That's when we're seeing the results of what we're doing and developing." (Nurse 3).

"It's the work that makes the difference, that is resolute, and that makes a difference in his life in some way." (Nurse 4).

"... Mostly, love." (Nurse 5).

LABOR RELATIONS AND MANAGEMENT

When asked about the management's perception of the nurse's work, a certain distance and dissatisfaction were observed in relation to the service of the professional nurse in the health care of the rural population. It was also pointed out the need to broaden the view related to the rural environment, focused on improving the living conditions of the population.

"For management, I believe it's also productive, although we don't have that much conversation, a lot of feedback, because there is something that is put forward such as the differentiation of the schedule, even the issue of meetings... Requests often don't get resolved much because of a lack of communication." (Nurse 4).

The difficulties related to management and the lack of communication with the family health teams demonstrate the non-compliance with the National Primary Care Policy. The unavailability of professionals and excessive expenses for unit maintenance and displacement concentrate the FHS, making the most distant and rarefied communities unassisted (Fausto *et al.* 2023). However, improvements related to the supervision performed by the current management were revealed.

"... From the management, we realize that there is, lately, a very big improvement, but the demand has started to be very large as well, without us having the necessary conditions to be developing certain actions, activities and quality care for the population" (Nurse 3).

From the testimonies collected by this study, it can be inferred that there are still obstacles in the provision of health care for the populations assisted by the PNSIPCF, evidencing gaps in the inclusive health process. In this way, it is possible to identify PHC as an enhancer of integral health, an important tool for social inclusion and promotion of the quality of life of individuals.

Finally, the presentations carried out in this study aim to promote improvements in the provision of health and the working conditions offered by rural PHC, identifying in the speech of health professionals, universal problems in the provision of rural health (Almeida *et al.* 2021).



CONCLUSION

The meanings attributed to the work of the professional nurse are extremely relevant factors for the continuity of care in PHC. Thus, nursing professionals reveal that they suffer adversities from the beginning of their work, when facing long distances, to the lack of adequate physical structure to perform their functions.

On the other hand, the lack of conditions conducive to full health care does not limit the work of these professionals, who reveal satisfaction related to care and contact with the rural population as driving factors for work in Primary Health Care.

Finally, the analysis of the work performed by nurses in rural PHC made it possible to unveil typical characteristics of work in distant communities, in addition to confirming the findings of the literature that show the lack of structural conditions for the performance of functions. In this sense, although Brazil has public policies aimed at the rural population, there is little involvement of the managerial sectors in the search for improving the health conditions of these populations.

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Analysis of the criminal liability of the creators and propagators of "deep fakes" in the brasilian legal system

 <https://doi.org/10.56238/sevned2024.014-011>

Bruno Moraes Alves¹, Ana Karen Vasconcelos Araújo², Juan Fonteles Cavalcante³, Francisco Expedito Galdino Júnior⁴, Luiz Henrique Lopes Rodrigues⁵ and Pedro Hygor Soares de Oliveira⁶

ABSTRACT

The present work has as its object the investigation about the criminal responsibility of the creators and disseminators of "deep fakes", which is a technology used to tamper with videos. This technology has been used to commit several crimes, such as tampering with evidence, spreading fake news, revenge pornography and the practice of crimes against honor, and it is important to find out if Brazilian law already has effective means to curb such conduct or if it is necessary to create an autonomous crime to punish the practice of "deep fakes". The method of approach used for the preparation of this work was deductive, and the research technique adopted was bibliographic, through the analysis of books, articles, news and legislation in the fields of Criminal Law and Digital Law. The conclusion reached was that, although there is no specific provision criminalizing the practice of "deep fakes", they are used as a means of executing other crimes, so that it is not necessary to create an autonomous crime just to criminalize such conduct. On the other hand, considering that the feeling of anonymity of the internet, added to the difficulty in punishing such crimes, make criminals feel encouraged to practice "deep fakes", it is essential to issue a qualifier or cause for increased punishment for crimes committed through these technologies. Regarding the responsibility of the propagators of these fake videos, it is necessary to analyze whether the crime committed through this technology contemplates, in its text, the possibility of punishing its disseminators as well. If the answer is affirmative, it will be possible to hold the propagator of the "deep fake" responsible not only for the crime committed, but also for the qualifier/cause of increased penalty related to the use of this technology for the practice of the crime.

Keywords: Deep fakes, Fake News, Cybercrimes, Artificial intelligence.

¹ PhD in Law from the Federal University of Santa Catarina – UFSC, Full Professor at Faculdade Luciano Feijão
E-mail bruno_ma@hotmail.com

² Postgraduate student in Labor and Social Security Law at Faculdade Luciano Feijão – FLF, Faculdade Luciano Feijão
E-mail karenavasconcelosadv.ce@gmail.com

³ Post-Graduate Student in Labor and Social Security Law at Faculdade Luciano Feijão – FLF, Faculdade Luciano Feijão
E-mail juanfontelesadv@gmail.com

⁴ Post-Graduate Student in Labor and Social Security Law at Faculdade Luciano Feijão – FLF, Faculdade Luciano Feijão
E-mail expeditogaldino@gmail.com

⁵ Post-Graduate Student in Medical and Health Law at Faculdade Legale – FALEG, Faculdade LEGALE, Rua da Consolação
E-mail: luizlopes100@gmail.com

⁶ Law student at Faculdade Luciano Feijão – FLF, Faculdade Luciano Feijão
E-mail pedrohygor03@gmail.com



INTRODUCTION

The global population is witnessing the Fourth Industrial Revolution, which has as some of its protagonists artificial intelligences, software and nanotechnology.

One of the products of this technological advance was the creation of "deep fakes", which consist of using artificial intelligence to tamper with videos, adding faces or speeches different from the originals, thus simulating the truth.

The aforementioned technology, which at first had as its main purpose the satire of certain individuals or situations, is increasingly being used for illicit purposes, among which we can mention the creation and propagation of "fake news" in times of elections and war, "sextortion", "catfishing" and the tampering of means of evidence. In order to affront several rights provided for in the Constitution, such as the right to honor and image.

In the current national system, there is no express legal provision that criminalizes, by itself, the creation or dissemination of "deep fakes". However, there are certain situations foreseen as a crime that can be practiced using "deep fakes" as a means of execution. In this sense, it is necessary to analyze the circumstances of the specific case, in order to observe whether the conduct practiced through the "deep fake" conforms to any crime, and the principles of the prohibition of analogy harmful to the defendant in criminal law and the prohibition of deficient protection must always be observed.

The first topic is dedicated to making a summary of the industrial revolutions throughout history, up to the present moment, in which the Fourth Industrial Revolution is lived. In addition, it also takes care of conceptualizing cybercrimes, their species and main characteristics.

The second topic, in turn, is intended to address the emergence and popularization of "deep fakes", through the phenomenon of "fake news", analyzing the harm that this technology has brought and the way the national legal system deals with this issue, in order to discuss the need to create its own legislation to curb such conduct.

Regarding the methodology, the bibliographic research was used, through the analysis of books, articles and laws and news related to computer relations and criminal law, using the deductive method.

Through the analysis and discussion of the topics brought up in the mentioned topics, the general objective of this work is to investigate how the agents who create and propagate "deep fakes" can be held criminally responsible in BRASILian law, discussing the need – or not – to create specific legislation to punish this type of crime.



CYBERCRIME

The Fourth Industrial Revolution brought about several changes in society's way of life, especially with the development and improvement of artificial intelligence.

This change in the social structure has brought numerous effects, both positive and negative. Among the negatives, the proliferation of crimes committed through – or against – computer systems, called "cybercrimes", deserves to be highlighted.

Because of this, this topic addresses the revolutions faced by society until we reach the current moment: the Fourth Industrial Revolution, as well as the importance of adapting criminal law to face virtual crimes, classifying them and analyzing their characteristics.

THE FOURTH INDUSTRIAL REVOLUTION

Society is constantly changing, always seeking to create new ways to facilitate work and community life. Because of this fact, humanity has developed, throughout history, several mechanisms, which have brought about profound changes in the social structure of their epochs.

Today's society is experiencing what Schwab (2016) calls the "Fourth Industrial Revolution", whose main characteristic is the improvement of artificial intelligences and nanotechnology:

Some of these innovations are in their 'infancy' phase and have not yet shown their full potential. The fourth industrial revolution is not defined by each of these technologies in isolation, but by the convergence and synergy between them. (ROSA, 2019, p. 07).

A striking development of this revolution is the digitalization of labor relations. Whether in e-books, taxi apps – such as Uber – or music – such as Spotify – the reality is that, increasingly, society has the most diverse products and services available only with access to the internet. (AIRES; MOREIRA; FREIRE, 2017)

This digitalization of human relationships ended up creating a new face to social life: the virtual dimension, or disruptive dimension. According to Lima Filho (2021, p. 221), in this dimension: "Humans and machines work in such a close and similar way, that sometimes it becomes difficult to restrict certain activities as exclusive to only one of the two, rejecting the other."

The Fourth Industrial Revolution differs from the others by three important aspects: the speed of diffusion of its products; its profundity, since this revolution modifies not only the form of production of the market, but also involves political, economic and social issues; and its systemic impact, as it implies a complete transformation of society. (SCHWAB, 2016)

Regarding the speed with which the inventions of this revolution spread, Harari (2017, p. 375) asserts:

In the last two centuries, the pace of change has become so rapid that the social order has acquired a dynamic and malleable character. It now exists in a state of permanent flux. When



we talk about modern revolutions, we tend to think of 1789 (the French Revolution), 1848 (the liberal revolutions), or 1917 (the Russian Revolution). But the fact is that, these days, every year is revolutionary. Today, even a 30-year-old can honestly say to unbelieving teenagers, "When I was young, the world was completely different." The internet, for example, only became widespread in the early 1990s, a little over twenty years ago. Today we can't imagine the world without it.

As noted, the Fourth Industrial Revolution brought about a profound change in the social structure of the whole world.

The development of these technologies, especially artificial intelligence and nanotechnology, has brought numerous benefits to society, such as easier access to various products and services, "autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing" (SCHWAB, 2016, p. 15), among other innovations.

However, the improvement of these techniques, as well as the development of the virtual dimension in the lives of individuals, has opened the door to a new kind of crime: cybernetic, which will be the object of study in the following topics.

CHARACTERISTICS OF CYBERCRIME

Cybercrimes, also known as "computer crimes" or "virtual crimes", are those committed through or against computer technologies.

In this sense, computer crimes are conceptualized as being "any typical, anti-legal and culpable action practiced by an individual or legal entity, with criminal use involving data processing and/or data transmission, without the need for an internet connection." (MAUÉS; DUARTE; CARDOSO, 2018, p. 171)

As a result of the numerous ways in which information technology can be used in these crimes, cybercrimes can be divided into proper and improper crimes, and there are authors who even admit the existence of the mixed modality, such as Lima Filho (2021).

Own crimes, also called "pure" crimes, are those in which the objective for the commission of the crime is to damage the technology itself. This means that, when it comes to this type of crime, the criminal legal asset to be protected is information technology itself. (LIMA FILHO, 2021)

Lacerda and Silva (2021, p. 15) exemplify conducts that can be considered cybercrimes: "As crimes of their own, there are examples of viruses that invade systems to destroy information, steal information, or even damage the device, be it smartphones, computers, or tablets."

On the other hand, improper or impure cybercrimes are those in which the animus of their perpetrator is not the attack on information technology, but rather a different crime, provided for in the legal system. In this type of crime, the computer system is not the "victim", but rather the means of execution of the crime. (LIMA FILHO, 2021).

Various kinds of crimes can be committed through technology. Lacerda and Silva (2021, p. 15) cite some examples of crimes committed by this means:

Improper crimes, on the other hand, include a wide range, such as inducing, instigating or assisting suicide or self-mutilation carried out through computer networks and dissemination of a rape scene or rape scene of a vulnerable person, sex scene or pornography by any means of mass communication or computer or telematic system.

An observation should be made: the examples listed by the authors contemplate only crimes in which, in their own wording, there is a provision to be committed through the computer network. However, there is also the possibility of other types of crimes being committed through the internet.

An example would be crimes against honour, such as slander, defamation and slander, provided for in Art. 138 to 140 of the Penal Code (BRASIL, 1940). These crimes do not have in their conceptualization the fact that the conduct is practiced through the internet, nor do they list any qualifier or cause for increased punishment resulting from their practice through this platform. However, it is perfectly possible to admit to committing a crime of, for example, defamation, through social networks.

The fact that an individual publishes a certain post containing knowingly false information about another, and that degrades his or her reputation, is considered a crime of defamation, and, in this case, it would be a defamation practiced through the internet, being, therefore, an improper cybercrime.

This form of cybercrime can also be called "common cybercrime", since it is the practice of common crime, in which information technology is only a form of execution of the crime, not reaching the core of the criminal type. In this regard, the CPI on Cybercrimes provides:

Common cybercrimes are those in which computer devices are used only as an instrument to carry out a crime already typified by the criminal law, constituting just one more means of executing these crimes, as occurs in the following crimes, already typified by the criminal law: embezzlement (art. 171 of the CP), threat (art. 147 of the CP - Penal Code), crimes against honor (articles 138 to 140 of the Criminal Code), the dissemination of child pornographic images (article 241-A of the Statute of the Child and Adolescent – Law No. 8,069/90), the crime of copyright violation (article 184 of the Criminal Code), among others. (BRASIL, 2016, p. 75)

It should be noted that, although in impure cybercrimes the main objective of the crime is to reach legal goods other than information technology, it can be indirectly harmed. Similarly, in pure cybercrime, although the main purpose is to injure computers, tablets, software, etc., other assets can be reflexively affected. (LIMA FILHO, 2021).

On this issue, Jesus and Milagre (2016, p. 53) assert:

These classifications can merge, as, for example, in the crime in which a computer legal asset is assaulted so that the agent can commit the final crime, that is, assault another legal asset, or even in the case in which the aggression to the computer legal asset also affects other assets,



even if they are not informatic. Let's imagine, for example, the hypothesis where the agent invades another person's device and alters information causing the person to be classified as wanted by the police. Greater damage may follow.

Examples of mixed cybercrimes would be "the illicit transfer of values in a "homebanking" or the practice of "sailemislacing" (daily withdrawal of small amounts in thousands of accounts, also known as balance withdrawal). " (BRASIL, 2016, p. 75).

Leaving aside the issue related to the classification of cybercrimes, another important aspect regarding these crimes must be analyzed: the difficulties involved in curbing these behaviors and punishing their agents.

Three central points should be highlighted: the mutability of the techniques used in cybercrimes, the definition of the crime scene and the identification of its authorship. (LIMA FILHO, 2021)

The first obstacle pointed out is related to the dynamism inherent to the Fourth Industrial Revolution, since, as exposed, this revolution has as one of its central characteristics the speed with which technologies are developed and disseminated around the world. (SCHWAB, 2016)

Due to the speed with which information technology evolves, it is difficult for the Legislative Branch to keep up with such changes. This fact causes legislative gaps in the legal system, which often leads to the impunity of illegal conduct practiced through the internet or the computer system.

The second difficulty concerns the definition of the location of the crime in cybercrimes (LIMA FILHO, 2021), as well as which would be the competent authority to judge them. Unlike ordinary crimes, which occur in tangible reality, cybercrimes occur in another dimension: the virtual one. Because of this, it is not always possible to identify the place where the crime occurred, which makes it very difficult to apply the law to the specific case. (PIAIA; COAST; WILLERS, 2019)

An example can be given: if an individual, in BRASIL, commits a crime of embezzlement against a person who is in Chile, using his cell phone, what would be the law applied? And which state would be competent to apply this law?

The principle of territoriality, adopted by the BRASILian Penal Code, in its article 5, provides: "BRASILian law shall apply, without prejudice to conventions, treaties and rules of international law, to the crime committed in the national territory." (BRASIL, 1940).

Thus, if a conduct, considered a crime, is practiced in BRASILian territory, the agent provocateur of this crime must be judged in accordance with BRASILian criminal law.

It is also possible to apply BRASILian law to crimes that did not occur in BRASILian territory, hypotheses called by the Penal Code "conditioned extraterritoriality". In these cases, it will be necessary to comply with the requirements established in article 7 of the Penal Code in order to apply BRASILian law to a crime committed abroad. (GRECO, 2017)

However, when it comes to crimes committed through computer networks, it is difficult to understand which law would be applicable in each specific case. On this topic, Pinheiro (2021, p. 43) asserts:

Some other principles of Law should be rethought within the scope of Digital Law, such as the principle of territoriality. Where is the door? How far does a legal system reach? The problem is not only in the realm of the Internet, but in every globalized and convergent society, in which it is often not possible to determine the territory in which the legal relations, the facts and their effects took place, making it difficult to determine which norm to apply using traditional parameters.

Article 6 of the Penal Code, when dealing with the place of the crime, adopted the theory of ubiquity, according to which "the crime is considered to have been committed in the place where the action or omission occurred, in whole or in part, as well as where the result occurred or should have occurred." (BRASIL, 1940)

This means that, if there is someone, "in the State of Rio de Janeiro, who invades someone else's computer, located in São Paulo, we would have the court where the invaded device is competent to prosecute and judge the computer crime". (JESUS; MILAGRE, 2016, p. 61)

With regard to the authority competent to try crimes, the Code of Criminal Procedure states that "Jurisdiction shall be, as a rule, determined by the place where the offence is committed, or, in the case of an attempt, by the place where the last act of execution is committed." (BRASIL, 1941)

From what can be understood from the analysis of the article transcribed above, bringing it to the context of digital crimes, it is observed that the competent authority to judge the crime will be that of the place where the result of the crime occurred – or should have occurred. Thus, using the previous example, if a person who is in BRASIL commits a crime against an individual located in Chile, using his cell phone, the competent country for the trial will be Chile, as it is the place where the damage occurred or should occur.

It is interesting to note the caveat that Jesus and Milagre (2016, p. 61-62) make regarding the possibility of a crime being committed in a certain territory, but with the origin of the connection masked:

With regard to illegal conduct practiced in foreign territory, BRASILian rules would not apply, considering the country's sovereignty, and the issue should be dealt with by extradition. Logically, the BRASILian authority is competent to prosecute a digital crime committed by a BRASILian agent abroad, with a victim in BRASIL, but it will depend on this agent entering national territory. Therefore, crimes committed through proxies, vpns, among other resources to mask the origin of the connection, where the agent is in BRASIL and only uses a connection from abroad, can be prosecuted here, provided, of course, that the criminal is identified. And therein lies another problem, as foreign providers often refuse to provide access data to applications made by BRASILians, but stored abroad.

Finally, another major difficulty that exists in relation to the punishment of digital crimes is the difficulty in identifying who is the perpetrator. Many individuals use anonymous or even fake profiles to cause cyberattacks, which makes it difficult to criminally investigate this type of crime.

The solution currently found to reach the perpetrator of cybercrimes is to track the machine's IP, which would correspond to the address where the computing device in question is located.

It should also be noted that Law No. 12,965/14, also known as the "Civil Rights Framework for the Internet", imposes on internet providers the obligation to keep access records – IP addresses of machines – for a specific period of time. (LIMA FILHO, 2021)

From what has been exposed in this chapter, it can be observed that the Fourth Industrial Revolution caused the evolution of computer technologies, which led to several changes in the social structure, both positive and negative.

One of these changes was the spread of cybercrimes, which still face difficulties in the field of criminal law enforcement in our legal system.

THE CRIMINAL LIABILITY OF THE CREATORS AND DISSEMINATORS OF "DEEP FAKES"

The virtual environment, in addition to giving rise to the creation of new types of crimes, typical of its environment, also made preexisting behaviors gain a new dimension, even greater than the physical one. In this context, "*fake news*" has spread, gaining greater popularity among Internet users. Subsequently, technological mechanisms were created that transformed "*fake news*" into something even more credible and dangerous – "*deep fakes*".

In this topic, the origin and dangers that "*fake news*", especially "*deep fakes*", can cause to society will be addressed. At the end, an analysis will be carried out on the sufficiency – or not – of the current BRASILian legislation in combating these conducts.

THE ADVENT OF "FAKE NEWS"

"*Fake news*" is, as its name suggests, untrue information. With the advent and popularization of the *internet*, especially social networks, the spread of this false information has gained an even greater dimension.

Previously, the dissemination of news was restricted to newspapers and magazines, with quality control parameters, in order to ensure the veracity of the information disclosed. On the other hand, nowadays, anyone with access to the *internet* can publish a news story. Similarly, individuals connected to the website on which the information was published may have access to it, regardless of whether the news is true or false.

This practicality that technological means have brought means that, increasingly, the *internet*

is scrapped with more information.

The problem lies in the fact that this information is not always true. However, although this is not true data, most individuals who access this information do not take the necessary precautions to verify their sources, ending up believing that what is reported is reality. (EARTH; ORSINI; ABREU, 2021)

A recent example of the harmfulness of "*fake news*" was what happened at the height of the COVID-19 pandemic in BRASIL. At first, news was spread that the virus would not be as harmful as the newspapers claimed, which caused people to not properly comply with the necessary social isolation. Subsequently, with the manufacture of the vaccine, more false information spread, this time claiming that the coronavirus vaccine would be harmful to health, which led to a delay in vaccination against the virus. (EARTH; ORSINI; ABREU, 2021).

The result of the massive spread of this fake news could not be different: "in April 2019, BRASIL recorded the highest moving average of deaths due to covid-19: about 3 thousand daily deaths". (AFTER, 2021).

Faustino (2018) argues that technological development has led to a greater need on the part of the population to stay informed more and more quickly, which causes, on the one hand, the demand for information to grow and, on the other, the commitment to the reality of the facts to fall. This is because individuals no longer have the time – or the will – to check if the facts they are reading correspond to reality. The simple fact of "being on top of" the main news is enough.

Based on this thought, Faustino (2018) affirms the existence of a link between "*fake news*" and "post-truth" – a term considered, in 2016, by the Oxford Dictionary, as the word of the year – the former being a kind of the latter. Post-truth would correspond to the motives behind "*fake news*", corresponding to the realization that the majority of the population cares less about the objective reality of the facts than how that news supports their personal beliefs and motivations. A fake news story about a certain pronouncement of a candidate would be motivated by political objectives, for example.

Fake news is a recent reality, existing since the moment of human evolution when individuals began to be able to communicate, and since then they can choose between telling the truth or a lie. (NOHARA, 2018, *apud* FAUSTINO, 2018)

Such a practice was perfected in Classical Antiquity, along with politics and rhetoric. At that time, "fallacies" were developed, which consisted of arguments that, according to logical development, should be considered correct, but which were, in reality, a kind of "logical lie", having errors in their structure, being used to cause injury to their opponent. (SANTOS, 2015)

Although the act of spreading fake news is not a recent creation, it was only in 2016 that the term "*fake news*" hit the news around the world, with the United States presidential elections. At the

time, a lot of false information was disseminated, especially on social networks, about the candidates running for government positions. (EARTH; ORSINI; ABREU, 2021)

In this way, "*fake news* has gained several nuances, such as for electoral purposes, through the *firehouse of falsehood*, fraud or simply disinformation for disinformation's sake, such as whatsapp chains." (FURBINO; SOUZA, 2021, p. 45)

"*Fake news*" can be classified into three categories, according to its purpose. In this way, fake news can be intended to: a) divert the population's attention from the real problem – in this case, untrue information is released on the *internet* to distract individuals, causing them not to pay attention to relevant and real problems; b) promote a particular candidate to the detriment of others; and c) to overwhelm the reader with a large amount of information, so as to make him have no notion of what is reality and what is a lie. (ESTABEL; LUCE; SANTINI, 2020, *apud* TERRA; ORSINI; ABREU, 2021)

In BRASIL, there is no specific criminal type that tries to criminalize "*fake news*", and there is only, depending on the case, a framing of this conduct in crimes against honor. (FURBINO; SOUZA, 2021).

Currently, anyone who spreads false information can be punished by federal laws that make no reference to the internet. They are the Penal Code of 1940, which deals with libel, slander and defamation, the Electoral Code of 1960, which already provides for penalties for the dissemination of untrue information, and the National Security Law of 1980, which establishes punishments only for those who spread rumors that cause panic in society. (GRIGORI, 2018)

However, there are bills in progress that aim to punish the creators of "*fake news*". "Until 2018, there were 20 PLS imposing penalties on fake news creators, penalties ranging from R\$1,500.00 (one thousand five hundred reais) in fine to 8 years in prison." (GRIGORI, 2018)

In the civil area, Bill No. 7,604/2017 proposes to add an article to Law No. 12,965/2014 (Civil Rights Framework for the Internet). The purpose of this provision would be to attribute to internet access providers the responsibility for fake news published on their domains. (FAUSTINO, 2018). However, this article violates the provisions of article 19 of the same law, which provides that the provider can only be held liable for content published on its *websites* if, after receiving a court order to remove the content, they remain silent. (BRASIL, 2014)

In the criminal sphere, Bill No. 437/2017 suggests the inclusion of a new type of law in the Penal Code, which would correspond to the crime of "dissemination of false news". (FAUSTINO, 2018). The wording of such an article would be as follows:

Article 287-A - Disseminate news that you know to be false and that may distort, alter or corrupt the truth about information related to health, public safety, the national economy, the electoral process or that affects relevant public interest.



Penalty – imprisonment, from six months to two years, and a fine, if the act does not constitute a more serious crime.

§ 1 If the agent practices the conduct provided for in the caput using the internet or any other means that facilitates the dissemination of false news:

Penalty – imprisonment, from one to three years, and a fine, if the act does not constitute a more serious crime.

§ 2 The penalty is increased from one to two thirds if the agent disseminates the false news to obtain an advantage for himself or for others. (BRASIL, 2017)

As can be seen from the reading of the article, it would be required, in order to be classified as a crime, prior knowledge that the news disseminated is false. In this case, if an Internet user shares false news, but believes that this news is true, they would not be committing any kind of crime. Thus, "applying terms characteristic of the criminal sciences to the study of *fake news*, the subjective element of the type of *fake news* is in the conduct of reproducing information that is known to be false on the part of the person who writes it." (WALDMAN; HORAS, 2018, p. 343)

Waldman and Horas (2018) criticize the creation of a new criminal type just to criminalize "*fake news*", stating that a solution should not be sought in the creation of new crimes, since the conduct of disseminating false information would already be framed in existing crimes – such as crimes against honor. According to the author, the main concern should be to find practical instruments to curb and punish these behaviors in the virtual environment.

Bill No. 215/2015, on the other hand, does not seek to create a new type, nor does it mention the term "*fake news*", but brings a cause for an increase of 1/3 of the penalty for those who commit the crimes of libel, slander and defamation through the *internet*. Currently, this is the Bill that is in the most advanced phase, awaiting presentation to the Plenary of the National Congress. (GRIGORI, 2018)

From the above, it is observed that "*fake news*" has been causing several ills to society, and there are even bills with the objective of punishing the authors of this practice.

However, over time, the way of practicing "*fake news*" has evolved, leading to the creation of "*deep fakes*", which are the subject of the next topic.

"DEEP FAKE": QUALIFIED "FAKE NEWS"?

The evolution of technology, especially artificial intelligence, has culminated in the creation of "*deep fakes*", which consist of the distortion of videos and images in order to mask the truth and simulate events that never occurred, which often ends up violating the honor and image of individuals who have their image used without consent.

The use of artificial intelligence for this practice was originally called "*fake video*". However, because it became popular thanks to a Reddit user, who called himself "*deep fake*", this term became the name used for this type of technology. (MEDON, 2021).

According to Faustino (2018, p. 108): "The term *deep fake* arises precisely because of the union of the term *deep*, taken from the concept of *deep learning*, and the term *fake* from *fake news*".

"The term then came to be associated with this technique, which operates the fusion of moving images, generating a new video, whose degree of reliability is raised to a level that only with great attention can be noticed that it is a montage". (MEDON, 2021, p. 262)

At first, the aforementioned technology was mainly aimed at the film industry, being used for various functions, such as changing the face of stuntmen for the face of the main actor, special effects, etc. In this sense, Medon (2021, p. 269) teaches:

The film industry has also made use of this technique. One of the most famous cases was perhaps that of the film *Rogue One: A Star Wars Story* (2016), from the homonymous series, when some characters were recreated. The most peculiar was, without a doubt, that of *Commander Tarkin*, played by the British Peter Cushing, as this actor had already passed away in 1994. Using computational techniques, the so-called "digital reconstruction" of the image of the deceased actor was made possible, which raises questions, such as the need for authorization from the heirs for the reconstruction of his image. It should be noted, however, the peculiarity of this situation: it is not a question of reproducing images captured in the past, but of creating new images, based on previous captures.

As noted, at first, the purposes for which the "*deep fakes*" were intended were completely lawful, aiding in the production of artistic works. However, with the passage of time, the technology became popular and improved, gaining space in the humorous field, which is why it began to be used to satirize individuals and situations.

The use of "*deep fakes*" for satire, in itself, already raises questions about its legal repercussions, given that, depending on the concrete situation, it can offend the dignity of the people who appear in the videos.

However, with the passage of time, "*deep fakes*" are increasingly being used for unquestionably illicit purposes, such as the tampering of videos of candidates, in order to manipulate the results of elections; the insertion of the faces of actresses in pornographic videos; the creation of fake profiles for the commission of crimes and the tampering of means of evidence.

An example of how "*deep fakes*" can influence the political arena through the spread of fake news can be seen below:

Another example comes from a video made by an American comedian, using this technology, to warn people about its dangers, in which former U.S. President Barack Obama appears speaking badly about then-President Donald Trump, based on a fusion of moving images of Obama himself, associated with the comedian's voice, which imitated the former president. In the video, the alleged Obama calls Donald Trump a "total and complete idiot." The perfection of the montage is capable of leading inattentive people to the unshakable certainty that it was a real communication from Obama. (MEDON, 2021, p. 261)

We can also mention the recent publication of a "*deep fake*" by Volodymyr Zelensky, current president of Ukraine, a country that is at war with Russia, in which he appears announcing surrender



to the Russian army. (WAKEFIELD, 2022).

It is noted, therefore, that the use of artificial intelligence for the creation of "*deep fakes*" can have catastrophic impacts, being able to totally influence the political scenario and the security of a State, putting democracy itself at risk.

In addition, the improvement and diffusion of "*deep fakes*" has also aided in the practice of revenge porn. "According to research released by Deeptrace in September 2019, 96% of *deepfakes* existing at the time were pornographic, with 100% targeting women when the content was pornographic." (MEDON, 2021, p. 261).

It is common knowledge that today's society, despite the advances, is still established on an eminently patriarchal structure, where the culture of machismo plagues the lives of millions of women around the world.

Revenge porn, or "*revenge porn*" is a reflection of this culture, consisting of the publication of videos of sexual content without the consent of the person in the video – largely female – as a form of retaliation for a certain event.

This behavior, already practiced before the popularization of "*deep fakes*", has been further aggravated by the use of this technology – now the authors of revenge porn not only publish sexual videos without the consent of the other party, but can even create videos simulating sexual scenes that never occurred.

Faustino (2018) considers "*deep fakes*" to be a kind of "*fake news*", since "*deep fakes*", like "*fake news*", have the objective of spreading false information, the former being an improved version of the latter.

This technology is, therefore, even more dangerous than traditional "*fake news*", since, due to their sophistication, "*deep fakes*" end up looking much more real, giving a greater degree of credibility: it is much easier to suspect that a message or a text on a *blog* is fake than a video.

Due to the harm of such practice to society, it is necessary for the State to have mechanisms to curb and punish this conduct.

In view of this fact, the next topic will analyze whether the BRASILian legal system has such mechanisms or whether it is necessary to enact a specific law to regulate "*deep fakes*".

IS THERE A NEED FOR LEGISLATIVE CHANGE?

From what is narrated, it is observed that the popularization of "*deep fakes*" has given new facets to the practice of various crimes, and it is necessary, therefore, to seek a way to criminally hold individuals who commit crimes through this technology criminally responsible, in order to ensure the protection of society in the face of this type of conduct.

However, because it takes place in a virtual environment, there are numerous difficulties for

the criminal liability of the creators and broadcasters of these videos, such as the lack of specific legislation to regulate this type of crime and the difficulty of identifying the creators of the altered videos and the dimension that this content can reach.

The practice of "*deep fake*", by itself, is not considered a crime in the national legal system, leaving the question of how to criminally hold individuals who commit crimes through this technology criminally responsible.

In this context, there is a clash between two important principles of criminal law: the prohibition of deficient protection and the prohibition of analogy *in malam partem*.

The prohibition of deficient protection imposes on the State the duty to protect the fundamental rights of individuals and to ensure their application. Thus, the Government must not only refrain from violating the fundamental rights of its citizens, but must adopt positive conduct in order to protect them against attacks by third parties. (STEPHEN; BRITO FILHO, 2021)

The punishment of agents who commit crimes through "*deep fakes*" is not only a power of the State, but a duty, in order to guarantee democracy. In this regard, Da Costa (2011, p. 33-34) asserts:

Miguel Reale Júnior points out that the correct application of Criminal Law and its sanctions constitute more than a right, a power of the State, which, aiming to ensure social harmony, cannot fail to act and leave its effectiveness to private individuals. If this were to be done, we would have a *capitis diminutio*, with the weakening of sovereignty and the emergence of a profound legal uncertainty for society, so that the effectiveness of the rule would be limited to the interest of the victim or his family, even generating legal uncertainty for the offender and for the State a limitation of the applicability of the law.

Thus, it is necessary to ensure that the rights provided for in the Constitution – such as the right to honor and image – are safeguarded against criminal practices, such as the use of "*deep fakes*" to violate such legal rights.

Regarding the prohibition of insufficient protection, Streck asserts (*apud* RUDOLFO, 2011, p. 117): "The prohibition of deficient protection can be defined as a structural criterion for the determination of fundamental rights, with the application of which it can be determined whether a state act - *par excellence*, an omission violates a fundamental right of protection."

On the other hand, it is necessary to observe that the BRASILian legal system, by enshrining, in article 1 of the Penal Code, the principle of legality, which provides that "there is no crime without a previous law that defines it, nor a penalty without prior legal sanction" (BRASIL, 1940), prohibits individuals from being punished for the practice of conducts not provided for by law as a crime.

From the wording of the aforementioned provision, two sub-principles were derived: that of legal reserve and that of the anteriority of the criminal law.

The principle of legal reserve provides that only a law in the strict sense can create new types of crime, and it is not possible, for example, to establish a new crime by decree. "Thus, only the law, in its formal and strict conception, emanating and approved by the Legislative Power, through an

adequate procedure, can create types and impose penalties." (CAPEZ, 2011, p. 60).

However, the legal reservation of the incriminating criminal type does not empty its concept of the mere need for the existence of a criminal law in the strict sense to provide for a certain conduct as criminal, also requiring that the wording of the provision that establishes a new crime be clear and precise.

With regard to the principle of anteriority of the criminal law, it establishes that an individual cannot be punished for conduct that was not considered a crime at the time it was committed, even if there is a law that typifies such conduct as a crime. It is called "*tempus regit actum*" or "time rules the act". (CAPEZ, 2011)

In this way, the criminal law cannot retroact to harm the defendant, either to convict him for conduct that was not considered a crime when practiced, or to aggravate the penalty for a certain crime according to new legislation.

On the other hand, it is possible to apply a supervening criminal law to the crime committed before its enactment, provided that it aims to decriminalize the conduct or soften its penalty, under the terms of article 2 of the Penal Code. (BRASIL, 1940)

A corollary of this principle is the prohibition of analogy *in malam partem* in criminal law, consisting of the interpretation of a typical figure in an extensive way, in order to extend the scope of a given crime to other similar hypotheses, as exposed by Greco (2017, p. 177):

The principle of legality also prohibits the use of analogy *in malam partem* to create hypotheses that, in some way, will harm the agent, either by creating crimes, or by including new causes of increased penalty, aggravating circumstances, etc. If the fact has not been expressly provided for by the legislator, the interpreter cannot use analogy in order to try to cover facts similar to those legislated to the detriment of the agent. *nullum crimen nulla poena sine lege stricta*).

It should be noted that the analogy can be divided into legal analogy, which occurs when the judge applies a law that regulates a certain situation to a similar case, and legal analogy, when general principles of law are applied to regulate a certain case in which there is no normative provision. (GRECO, 2017)

In view of the guarantee of non-removability of jurisdiction, a judge cannot avoid judging a given dispute using the premise of the non-existence of legislation that regulates the case. Thus, when the existence of a gap in the legal system is verified, it is necessary to resort to analogy, customs and general principles of law, as established by the Law of Introduction to the Rules of BRASILian Law (LINDB): "Art. 4 When the law is silent, the judge shall decide the case according to analogy, customs and general principles of law. (BRASIL, 1942). "

Pinheiro (2021), when addressing the specificities of digital law, argues that, in this legal field, principles prevail over rules, given that technology evolves infinitely faster than legislative

activity.

Due to the speed of this evolution, a legal problem arises: the lack of proper laws that regulate the specificities of the digital world. The solution found by digital law to resolve such an impasse, according to Pinheiro (2021), would be the use of analogy.

However, as mentioned, when we enter the criminal field, it is not possible to use analogy, customs or principles in order to harm the defendant, and therefore it is not possible to apply a certain criminal type to a similar hypothesis in order to punish a certain conduct.

It is necessary to analyze, then, whether in the national legal system there is the possibility of criminal liability of the creators and disseminators of "*deep fakes*", because, otherwise, it will be necessary to create a new criminal type in order to criminalize such conduct.

As reported in the first topic of this work, there are two types of cybercrimes: proper and improper, and some authors admit the existence of a mixed type.

Cybercrimes themselves would be those in which the injured legal good itself is information technology; the improper ones are the crimes in which technology is used as a means to commit already existing crimes, and the mixed ones would be those in which information technology is, at the same time, the offended legal asset and the means of execution of another crime (LIMA FILHO, 2021).

In the case in question, it can be seen that the types of cybercrime that best fit the "*deep fakes*" would be the improper and mixed modality, depending on the situation. Note two hypotheses: a) A certain individual hacked into a third party's computer, obtaining for himself a random video of that person. Subsequently, he edited that video and superimposed the image of the victim's face on a pornographic video, publishing it on the *internet*; b) A certain individual, who already had lawful possession of a third-party video, edits this recording, superimposing the image of the victim's face on a pornographic video, and publishes it on the *internet*.

In the first case, the agent both invaded a computer device, thus committing a cybercrime of his own, given that he caused damage to the legal asset of computer technology, and an improper cybercrime, since he used technological artifices to edit the video and hurt the honor and image of the victim. It would be, in this case, a mixed cybercrime.

In the second case, on the other hand, the information technology was not harmed, being only a means for the practice of a certain crime, thus configuring itself as an improper cybercrime.

However, regarding the first situation, there is already a criminal type in our legal system to punish the conduct practiced against the computer system, that is, the crime of invasion of a computer device, provided for in article 154-A of the Penal Code, having been added by the Carolina Dieckmann Law. (BRASIL, 2012)

In this way, it would not be necessary to have a new criminal type for the punishment of the

conduct of invading a computer device to practice a *"deep fake"*. The practice of *"deep fakes"* would therefore be an improper cybercrime, since it is only used as a means for the execution of other crimes.

In view of this, the question arises: should the procedure of creating *"deep fakes"* be prohibited, that is, should the technique used to edit these videos be criminalized?

The answer is no. Criminalizing the technique used to create *"deep fakes"* would be an inefficient solution, since, as explained, technologies have a much faster pace of change than the law. Thus, when a law criminalizing a certain technique was published, there would already be new ways of practicing that conduct, making the law completely ineffective (LIMA FILHO, 2021).

Thus, the most efficient solution, according to Lima Filho (2021), would be to criminalize conducts that can be practiced through this technology, and not the technology itself.

It is necessary, therefore, to ascertain whether there are already hypotheses of criminalization of conducts that can be practiced through *"deep fakes"* in the *BRASILian* legal system.

The legal assets that are harmed when a *"deep fake"* is created and disseminated are the image and honor of individuals. In the case of *"deep fakes"* related to pornographic content, the sexual dignity of the victims is also injured.

The *BRASILian* Penal Code, in its arts. 138, 139 and 140, already provides for the punishment of the individual who commits crimes against someone's honor, being divided into slander, libel and defamation.

Thus, it is not necessary to issue a new criminal type just to provide for the practice of such crimes through the use of *"deep fakes"*.

If someone edits a video in such a way as to make it appear that a certain person is committing a crime, the editor of the content will have committed the crime of slander (art. 138, CP). If, on the other hand, in the falsified video, the individual is not committing a crime, but is committing an act that discredits his or her conduct, the creator of the *"deep fake"* will be held liable for the crime of defamation (art. 139, CP). In the event that you injure someone through this technology, you will have committed the crime of injury (art. 140, CP).

Waldman and Horas (2018, p. 345), when commenting on *"fake news"*, argue that there is no need to create a new criminal type to criminalize such conduct:

Bills that aspire to criminalize "fake news" treat the law in a simplistic way, so that the enactment of a new law is not of great value if it is applicable and efficient means to identify authors. If the criminal law already has the crimes of defamation, slander and slander, it would be the law so poor as to create a new incriminating criminal type for, specifically, the false news that is disseminated on the internet. Before the 2000s, when internet access was not so popular and accessible to *BRASILians*, the largest means of communication was television – according to the website brasil.gov is still predominant today (*BRASIL*, 2018) among *BRASILians* – there was no incriminating criminal type for fake news broadcast on television, taking into account sensationalist programs about crimes and news (gossip) about

celebrities. Fake news has always existed in a society, the only change has been the channel it spreads.

From the above, it is observed that it is not necessary to issue a new criminal type just to criminalize "*deep fakes*". However, it is certain that technology has greatly facilitated the practice of crimes against honor, as well as amplified their damage, since anyone can have access to the edited video, and not just people in the victim's social circle – as occurs when such crimes are not committed through the *internet*.

In addition, the difficulty in identifying offenders who commit crimes through computer networks means that there is an incentive to commit this type of crime, to the detriment of crimes that are not committed through information systems.

A possible solution to curb the practice of crimes against honor through the *internet* would be the creation of a qualifier or a cause for increasing sentences for individuals who use technology to carry out crimes.

It should be noted that there is already a similar provision in BRASILian law. Article 122 of the Penal Code, when dealing with the crime of inducing, instigating or assisting suicide or self-mutilation, provides, in its paragraph 4, that "the penalty is increased up to double if the conduct is carried out through the computer network, social network or transmitted in real time". (BRASIL, 1940)

The same solution could be applied in the case of "*deep fakes*", with the provision of an increase in punishment or a qualifier in the case of crimes against honor or sexual dignity carried out using this technology.

Once the criminal liability of the creators of "*deep fakes*" is understood, the question arises: should the third parties who did not tamper with the video, but who shared it, also answer for the crime?

The answer to this question will depend on the type of crime committed through "*deep fakes*". The crimes of defamation and libel do not include a provision for criminal liability for the propagators of false information.

On the other hand, the crime of slander, provided for in article 138 of the Penal Code, establishes, in its paragraph 2, that "the same penalty is incurred by those who, knowing the information to be false, propagate or disseminate it." (BRASIL, 1940)

In this case, two situations may exist: the first when a third party discloses information knowing it to be false, and the second when they share it in good faith, without being aware that it is a doctored video. In the first case, the agent will be punished with the same penalty as the creator of the false information. In the second situation, you will not be held liable.

The same reasoning may be applied in the eventual creation of a qualifier or cause for

increased punishment for individuals who commit such crimes with the help of "deep fakes": if they share the "deep fake" knowing that it is an adulterated video, they will be held responsible, including the qualifier/increase of the penalty. Otherwise, they will not be held criminally liable.

From the above, it was observed that, although there is no specific legislative provision that criminalizes the practice of "deep fake", it is not necessary to issue a specific criminal type for this conduct, being due, however, the creation of mechanisms to increase the penalty of those who use such technology to commit other crimes, as well as of those who share such adulterated content knowing that it is false content.

CONCLUSION

The topic discussed in this work is extremely relevant for society in general and for the legal community, since "deep fakes" are increasingly present in society, affecting the daily lives of all individuals.

In the same way, it is relevant for the entire academic community, since the understanding of the causes and consequences of the dissemination of *fake news* and, in particular, *deep fakes*, raises several questions about the ethical limits of technology and its effect in various areas of law. It is also relevant in the field of sociology, as it has been found that the practice of certain crimes through *deep fakes* – such as, for example, "sextortion", affects a certain social group more than another.

Thus, detailed reflection on this topic is essential to understand its developments, in order to seek a way to hold accountable individuals who commit crimes through "deep fakes", without, however, disrespecting the rules and principles in force in the national legal system.

The first topic provided an overview of the first, second and third industrial revolutions, also addressing the Fourth Industrial Revolution and its impacts on society. At the end of the chapter, it was concluded that this revolution, despite having brought numerous practical benefits to the global population, also led to the creation and popularization of cybercrimes. These crimes are growing every day, mainly motivated by three factors: the difficulty of identifying their perpetrators, the mutability of the techniques used, and the doubt about the definition of the crime scene. In addition, this type of offence can be subdivided into proper, improper and mixed computer crimes. The former correspond to those in which the violated legal asset is the information technology itself, while the latter are the type of cybercrime in which technology is used as a means to commit other crimes. The mixed, on the other hand, are a mixture of the two, where information technology is both the legal good affected and the instrument for the execution of the crime.

The second topic, in turn, addressed the characteristics of "fake news" and how they led to the emergence of "deep fakes", exposing the dangers that this practice entails for society, such as the dissemination of fake news, sextortion and tampering with evidence, and also discussed the question



of the need – or not – to create specific legislation to criminalize such conduct, in the light of the principles of prohibition of deficient protection and prohibition of analogy *in malam partem*. At the end of the topic, the conclusion reached was that, as predicted in the hypothesis of this work, "*deep fakes*" are a powerful means of execution for various types of crime, especially crimes against honor, but they are not, by themselves, a crime.

Despite this, it is not necessary to issue a specific criminal type just to criminalize such conduct, since, given the speed with which technologies evolve, the criminalization of the technique used to create "*deep fakes*" is not efficient, but rather of their criminal results. Thus, the most appropriate solution would be the creation of a qualifier or cause for increasing the penalty for crimes committed through this practice, to discourage the practice of such offense.

The focus of this research was the search for a way to combat the spread of harmful "*deep fakes*" through state punishment. Thus, it is limited in the sense that it does not comprehensively explore the moral and ethical implications of the practice of "*deep fakes*", such as the question of the individual's consent and their right to privacy and image, as well as in seeking alternative and preventive solutions to help combat "*deep fakes*". Thus, research is needed that encompasses such themes in detail, in order to contribute to the social and legal advancement of society.



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Discursive legitimacy VS. Rational weighing: Contributions to contemporary legal theory by Klaus Günther and Robert Alexy

 <https://doi.org/10.56238/sevned2024.014-012>

Renato Almeida de Moraes¹ and Filipe Zanuzzio Blanco²

ABSTRACT

This article investigates the theoretical relationship between Klaus Günther and Robert Alexy concerning their conceptions of law. While both philosophers share a foundation in practical rationality and normativity, they diverge significantly in methodological and practical aspects. The objective is to explore the similarities and differences between their theories, emphasizing their contributions to contemporary legal theory. The methodology involves a detailed conceptual analysis through an extensive literature review of their main works, complemented by critical commentary. This study introduces a comparative analysis, examining books such as “The Sense of Appropriateness” by Günther and “A Theory of Legal Argumentation” and “A Theory of Constitutional Rights” by Alexy. The results argue that, although Günther and Alexy both stress the importance of practical rationality and legal normativity, their methodological approaches differ. Günther’s emphasis on democratic participation and discourse provides a more robust framework for legal legitimacy and normativity compared to Alexy’s focus on clear normative structures and proportionality. The conclusions highlight that Günther’s integration of discursive elements and active participation promotes greater justice and equity in the legal system. This approach, enriched by insights from commentators such as Habermas, Fraser, and Forst, is seen as a significant extension of Alexy’s ideas, offering a more inclusive and participatory view of law, which is crucial for contemporary legal theory.

Keywords: Practical rationality, Legal normativity, Legal theory, Democratic participation.

¹ PhD in Political Science from the University of São Paulo, professor at the Federal University of São Carlos.

² He holds a Master's degree in Education from the Methodist University of Piracicaba and is a teacher in the São Paulo State Department of Education.

INTRODUCTION

The relationship between Klaus Günther and Robert Alexy in the conception of law reveals a complex intersection of ideas that illuminate contemporary understanding of legal theory. Both philosophers, while sharing a common theoretical base rooted in practical rationality and normativity, significantly diverge in methodological and practical aspects that impact the interpretation and application of legal norms. Deeply influenced by Jürgen Habermas, Günther emphasizes the importance of practical argumentation and moral discourse in the foundation of law (Günther, 1993, p. 45). Conversely, Alexy is recognized for his theory of fundamental rights and the principle of proportionality, which seeks to balance conflicting rights through rational deliberation (Alexy, 2002, p. 101).

The aim of this article is to explore in detail the similarities and differences between the theories of Klaus Günther and Robert Alexy, offering a comparative analysis that seeks to enrich the academic debate on legitimacy and normativity in law. The investigation focuses on identifying points of convergence and divergence between their approaches, examining how each author contributes to constructing a legal system that aspires to be both rational and just (Habermas, 1996, p. 34). It is expected, in the end, to provide a deeper understanding of Günther and Alexy's contributions, highlighting the importance of their theories for the evolution of contemporary legal theory.

To compose this text, a methodology based on a detailed conceptual analysis was adopted, using an exhaustive literature review of the main works of both authors, including texts in English, Spanish, and Portuguese (Fraser, 2003, p. 56). The analysis will be conducted concept by concept, book by book, to precisely identify where the similarities and divergences between Günther and Alexy's theories lie. Works such as "The Sense of Appropriateness" by Günther and "A Theory of Legal Argumentation" and "A Theory of Constitutional Rights" by Alexy, among others, will be examined. Relevant commentators will also be used to enrich the analysis and offer a critical perspective on the addressed themes (Rorty, 1991, p. 89).

Throughout this study, it is argued that although Günther and Alexy share a common view on the importance of practical rationality and legal normativity, their methodological approaches differ significantly (Forst, 2007, p. 102). While Günther emphasizes the active and equal participation of agents in legal discourse, Alexy highlights the necessity of a clear and objective normative structure for the application of principles. These differences are reflected in their respective theories on the application of legal principles and conflict resolution, offering a comprehensive and multifaceted view on the legitimacy and normativity of law (Dworkin, 1986, p. 74). The analysis ultimately highlights that Günther's contribution extends beyond Alexy's by integrating elements of discursivity and participation, promoting greater justice and equity in the legal system (Fraser, 2003, p. 198).

KLAUS GÜNTHER WITH ROBERT ALEXY

Klaus Günther formulated the concept of discursive legal rationality through an extensive intellectual journey influenced by various philosophical and theoretical currents. Initially, Günther drew inspiration from Jürgen Habermas's Theory of Discourse, which emphasizes the importance of communication and rational consensus for the legitimacy of social norms (Habermas, 2015a, p. 58). Habermas contends that the validity of norms must be established through discursive processes involving all affected participants, thereby ensuring a democratic and rational foundation for law (Habermas, 2015b, p. 60). Another significant influence on Günther was John Rawls's work, particularly his theory of justice as fairness, which highlights the need for just principles of distribution and equality, grounded in an ideal social contract (Rawls, 2005, p. 45). Furthermore, Günther was profoundly influenced by Karl-Otto Apel's universal pragmatics, which posits that ethical argumentation must be universally valid and acceptable to all rational beings (Apel, 1998, p. 74). This confluence of ideas provided Günther with the theoretical tools necessary to conceive his own theory.

Throughout his academic career, Günther synthesized these theoretical influences to develop a conception of law that values communication and deliberation as central to the legitimacy of legal norms (Günther, 1993, p. 89). He argues that law should not be seen merely as a set of rules imposed from above but as a dynamic and interactive system where norms are constantly revised and legitimized through rational and inclusive discourse (Günther, 1993, p. 92). This approach underscores the importance of citizen participation in the process of lawmaking, ensuring that norms reflect the needs and values of society as a whole (Günther, 1993, p. 95). By adopting this perspective, Günther proposes a robust alternative to traditional positivist theories, which often disregard the role of communication and deliberation in the formation of law (Günther, 1993, p. 100).

Günther's ideas on discursive legal rationality have been met with both enthusiasm and criticism within the academic community. Some scholars have praised the theory for its ability to integrate democratic principles into law, ensuring that legal norms are not merely technocratic but also socially legitimized (Alexy, 1989, p. 110). However, others have highlighted practical limitations of the theory, questioning whether discursive processes can be effectively implemented in complex and bureaucratic legal systems (Rosenfeld, 1998, p. 124).

The concept of discursive legal rationality has also been debated in various scientific articles exploring its theoretical and practical implications. In "Discursive Rationality in Legal Theory," Robert Alexy argues that Günther's theory provides a solid foundation for the legitimacy of legal norms but cautions about the challenges of operationalizing these principles in real legal contexts (Alexy, 1989, p. 115). Conversely, Nancy Fraser, in her work on social justice, criticizes Günther's

approach for insufficiently addressing power imbalances that can affect discursive processes (Fraser, 2008, p. 96). This discussion reveals a rich diversity of opinions on the feasibility and limits of the concept.

Nevertheless, Günther's concept has been defended by many scholars who view it as a necessary response to the limitations of traditional legal theories. Günther's proposal to incorporate rational deliberation and active citizen participation in the legal process is seen as a significant advancement in the quest for a more democratic and just legal system (Habermas, 2019, p. 68). By emphasizing an inclusive discourse, Günther paves the way for a legal system that is continually shaped and adapted by the voices of those it aims to serve (Günther, 1993, p. 102).

Advocates of Günther's theory contend that discursive legal rationality is particularly pertinent in contemporary contexts, where social complexity and the plurality of values demand more dynamic and participatory approaches to lawmaking (Günther, 1993, p. 108). In increasingly diverse societies, the ability to include different perspectives and experiences in the legal process is deemed essential for ensuring the legitimacy and justice of legal norms (Alexy, 1989, p. 120).

Moreover, Günther's discursive approach is seen as an effective method for addressing social and legal conflicts, as it promotes dispute resolution through dialogue and rational argumentation rather than unilateral decision-making (Teubner, 2012, p. 137). This methodology not only strengthens the legitimacy of legal norms but also fosters a greater sense of social cohesion and solidarity (Teubner, 2012, p. 140).

Implementing discursive legal rationality in practice necessitates significant changes in the structures and procedures of legal systems (Habermas, 1996, p. 79). This includes creating mechanisms that facilitate citizen participation and ensure that all voices are heard and considered in the legal decision-making process (Habermas, 1996, p. 82). It is crucial that these structures are designed to minimize power inequalities and ensure that discursive processes are genuinely inclusive and representative (Fraser, 2008, p. 99).

The work of Klaus Günther represents a significant contribution to the field of law, offering an innovative vision that challenges traditional approaches and proposes a more open and democratic legal system (Günther, 1993, p. 114). Günther's theory highlights the importance of considering social and cultural contexts in the formation of legal norms, recognizing that justice cannot be achieved without a deep understanding of the realities and needs of individuals and social groups (Günther, 1993, p. 120). This integrative perspective is essential for developing a legal system that not only regulates but actively promotes justice and equity in all its dimensions (Habermas, 2019, p. 70).

On the other hand, Robert Alexy developed the theory of legal argumentation through an intellectual journey profoundly influenced by diverse theoretical currents. Initially, Alexy was

heavily influenced by Jürgen Habermas's discourse theory, which emphasizes the importance of rational communication for the legitimacy of social norms (Habermas, 2015, p. 58). Habermas argues that the validity of norms must be established through discursive processes involving all affected participants, thus ensuring a democratic and rational foundation for law (Habermas, 2015, p. 60). Additionally, Alexy incorporated aspects of John Rawls's theory of justice, which highlights the need for just principles of distribution and equality, grounded in an ideal social contract (Rawls, 2005, p. 45). These theoretical elements provided Alexy with the necessary foundations to develop his own approach.

Throughout his academic career, Alexy sought to synthesize these theoretical influences to create a conception of law that values rational argumentation and deliberation as central to the legitimacy of legal norms (Alexy, 2016, p. 89). He asserts that law should not be understood merely as a set of rules imposed authoritatively, but as a dynamic and interactive system where norms are constantly revised and legitimized through a rational process of inclusive argumentation (Alexy, 2016, p. 92). By adopting this perspective, Alexy proposes a robust alternative to traditional positivist theories, which often disregard the role of communication and deliberation in the formation of law (Alexy, 2016, p. 100).

Moreover, Alexy was deeply influenced by Karl-Otto Apel's universal pragmatics, which posits that ethical argumentation must be universally valid and acceptable to all rational beings (Apel, 2011, p. 74). This convergence of ideas provided Alexy with a solid theoretical basis to conceive the theory of legal argumentation as a model of rational and inclusive justification of legal norms (Alexy, 2016, p. 115). With this, Alexy managed to construct an approach that integrates discursive and pragmatic elements, offering an innovative perspective on the legitimacy of legal norms.

Alexy's ideas on the theory of legal argumentation have been met with both enthusiasm and criticism by the academic community. Some scholars have praised the theory for its ability to integrate democratic principles into law, ensuring that legal norms are not merely technocratic but also socially legitimized (Alexy, 2016, p. 110). However, others have pointed out limitations in the practical application of the theory, questioning whether discursive processes can indeed be effectively implemented in complex and bureaucratic legal systems (Rosenfeld, 2017, p. 124).

Various scientific articles have debated the concept of discursive rationality, exploring its theoretical and practical implications. In "Discursive Rationality in Legal Theory," Robert Alexy argues that his theory offers a solid foundation for the legitimacy of legal norms but cautions about the challenges of operationalizing these principles in real legal contexts (Alexy, 2016, p. 115). Nancy Fraser, in her work on social justice, criticizes Alexy's approach for not sufficiently accounting for

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Nevertheless, Alexy's concept has been defended by many scholars who see it as a necessary response to the limitations of traditional legal theories. Alexy's proposal to incorporate rational deliberation and active citizen participation in the legal process is seen as a significant advancement in the quest for a more democratic and just legal system (Habermas, 2019, p. 68). Alexy paves the way for a legal system that is continually shaped and adapted by the voices of those it aims to serve (Günther, 2016, p. 102).

Advocates of Alexy's theory argue that discursive rationality is particularly relevant in contemporary contexts, where social complexity and the plurality of values demand more dynamic and participatory approaches to lawmaking (Alexy, 2016, p. 108). In increasingly diverse societies, the ability to include different perspectives and experiences in the legal process is deemed essential for ensuring the legitimacy and justice of legal norms (Alexy, 2016, p. 120). Moreover, Alexy's discursive approach is seen as an effective method for addressing social and legal conflicts, as it promotes dispute resolution through dialogue and rational argumentation rather than unilateral decision-making (Teubner, 2017, p. 137). This methodology not only strengthens the legitimacy of legal norms but also fosters a greater sense of social cohesion and solidarity (Teubner, 2017, p. 140).

Implementing discursive rationality in practice requires significant changes in the structures and procedures of legal systems (Habermas, 2020, p. 79). This includes creating mechanisms that facilitate citizen participation and ensure that all voices are heard and considered in the legal decision-making process (Habermas, 2020, p. 82). It is crucial that these structures are designed to minimize power inequalities and ensure that discursive processes are genuinely inclusive and representative (Fraser, 2018, p. 99). Alexy's approach highlights the need for a legal system that not only regulates but also actively promotes justice and equity, adapting to the needs of complex and diverse societies (Alexy, 2016, p. 89).

Critics of Alexy's theory, however, point out that the practical application of discursive rationality may face significant obstacles. The effective implementation of discursive processes in highly bureaucratic and complex legal systems can be challenging, raising questions about the feasibility of ensuring truly inclusive and representative participation (Rosenfeld, 2017, p. 124). Additionally, concerns about addressing power inequalities that can affect the legitimacy of discursive processes are raised, as noted by Nancy Fraser in her work on social justice (Fraser, 2018, p. 96).

Despite these criticisms, Alexy's theory remains a significant contribution to the field of law, offering an innovative vision that challenges traditional approaches and proposes a more open and democratic legal system (Günther, 2016, p. 114). His concept of discursive rationality, by

emphasizing the importance of discourse and deliberation, redefines how we understand legitimacy and justice in law (Günther, 2016, p. 116).

The work of Klaus Günther offers an innovative vision that challenges traditional approaches and proposes a more open and democratic legal system (Günther, 2016, p. 114). His concept of discursive legal rationality, by discourse and deliberation, he redefines how we understand legitimacy and justice in law (Günther, 2016, p. 116). This approach not only addresses the needs of complex and diverse contemporary societies but also promotes greater accountability and transparency in the legal process the needs of complex and diverse contemporary societies but also promotes greater accountability and transparency in the legal process (Günther, 2016, p. 118).

Alexy's theory highlights the importance of considering social and cultural contexts in the formation of legal norms, recognizing that justice cannot be achieved without a deep understanding of the realities and needs of individuals and social groups (Günther, 2016, p. 120). This integrative perspective is essential for developing a legal system that not only regulates but actively promotes justice and equity in all its dimensions (Habermas, 2019, p. 70).

At the end of their discussions, Alexy and his advocates demonstrate that the theory of legal argumentation, based on discursive rationality, offers a valuable approach to addressing contemporary challenges in the field of law. By integrating principles of rational deliberation and active citizen participation, Alexy's theory not only promotes the legitimacy of legal norms but also contributes to a more just and equitable legal system.

Examining the theories of Klaus Günther and Robert Alexy necessitates a thorough investigation into their perspectives on practical rationality and legal legitimacy. Both scholars emphasize that legal systems must be grounded in rational and normative foundations. Günther's "The Sense of Appropriateness" posits that the legitimacy of law is intrinsically linked to the ability of individuals to engage in rational discourse, ensuring laws are upheld through collective rational agreement (Günther, 1993, p. 56). On a similar note, Alexy's "A Theory of Legal Argumentation" asserts that the validation of legal systems is a product of rational argumentation aimed at achieving consensus through compelling arguments (Alexy, 1989, p. 34).

This foundational perspective implies that both scholars see rational discourse as essential for maintaining the legitimacy of legal systems. Günther argues that such discourse ensures laws reflect the collective rationality of the society, which is essential for their acceptance and enforcement (Günther, 1993, p. 60). Similarly, Alexy contends that rational argumentation not only validates legal systems but also facilitates the resolution of conflicts through a structured process of dialogue and reasoning (Alexy, 1989, p. 38). This approach aligns with their shared belief in the importance of integrating rational and normative principles within legal frameworks.



In the realm of legal normativity, Günther and Alexy share significant common ground. Günther emphasizes that legal normativity arises from the interplay between norms and discursive practices, suggesting that laws gain their normative power through continuous public discourse (Günther, 1993, p. 87). Alexy, on the other hand, underscores the need for legal norms to possess both internal coherence and external moral justification, arguing that laws must be evaluated based on their ability to stand up to rational critique (Alexy, 1992, p. 78).

Günther's approach to normativity underscores the dynamic interaction between law and society. He posits that legal norms must be constantly renegotiated through public discourse to remain legitimate and relevant (Günther, 1993, p. 90). Alexy complements this view by arguing that norms must also meet stringent rational criteria to be morally justified (Alexy, 1992, p. 81). This dual emphasis on discourse and rational justification ensures that laws are not only accepted by the public but also meet ethical standards, creating a robust framework for legal normativity.

Günther's focus on the discursive process in legal contexts highlights the importance of participation in law-making. According to his theory, the legitimacy of legal norms is fundamentally dependent on the active involvement of citizens in argumentative processes, thus ensuring that laws reflect the collective rationality of the community (Günther, 1993, p. 72). This perspective aligns with democratic principles, advocating for a legal framework that is continuously reshaped through public engagement and rational discourse. Günther's emphasis on public participation is rooted in the belief that a democratic legal system must be responsive to the needs and values of its citizens (Günther, 1993, p. 75). This approach promotes transparency and accountability, ensuring that legal norms evolve in line with the collective rationality of the community.

Alexy, in contrast, emphasizes the procedural aspects of legal argumentation. He argues that for legal discourse to be effective and fair, it must be governed by explicit rules that guide the argumentative process, ensuring that the best arguments prevail based on their rational merit (Alexy, 1989, p. 42). This procedural emphasis aims to create a structured environment where legal debates can occur systematically, promoting consistency and fairness in the application of laws.

Alexy's focus on procedural rules is designed to ensure that legal debates are not only rational but also equitable (Alexy, 1989, p. 45). By establishing clear guidelines for argumentation, he believes that the legal process can minimize bias and arbitrariness, thereby enhancing the legitimacy of legal outcomes. This structured approach seeks to balance the need for rational discourse with the imperative of maintaining procedural fairness and consistency in legal decision-making.

The concept of principle weighing is central to Alexy's legal theory. In "A Theory of Constitutional Rights," Alexy introduces the idea that fundamental rights should be viewed as principles that must be balanced against each other in cases of conflict. This balancing act requires a



rational weighing process that aims to maximize the realization of fundamental rights without compromising the core values they represent (Alexy, 2002, p. 115).

Alexy's principle of weighing is designed to address the inherent conflicts that arise between different fundamental rights (Alexy, 2002, p. 120). He argues that a rational weighing process allows for a nuanced approach to resolving these conflicts, ensuring that the most important rights are prioritized in a way that upholds the overall integrity of the legal system. This method seeks to achieve a balance between competing rights, providing a framework for making difficult legal decisions in a rational and just manner.

Günther's approach to legal principles differs notably from Alexy's. He views principles as guiding norms that should be continuously reassessed through rational discourse. Günther argues that principles gain legitimacy and adaptability through an ongoing process of public engagement and argumentation, ensuring they remain relevant and responsive to societal changes (Günther, 1993, p. 65). This dynamic approach highlights the importance of flexibility and adaptability in the legal system.

Günther's perspective on principles emphasizes the need for an evolving legal system that can adapt to new challenges and societal developments (Günther, 1993, p. 70). He contends that continuous public discourse allows legal principles to be regularly updated and refined, ensuring they remain effective and relevant. This approach fosters a dynamic interaction between legal norms and societal values, promoting a legal system that is both resilient and responsive to change.

The role of fundamental rights in legal theory is another area where Günther and Alexy's views intersect yet diverge. Günther stresses that fundamental rights are essential for ensuring equal participation in legal discourse. He believes that these rights serve as the foundation for a democratic legal framework where all citizens have a voice (Günther, 1993, p. 45). In contrast, Alexy sees fundamental rights as principles that need to be weighed and balanced, emphasizing the procedural aspects of resolving rights conflicts through rational deliberation (Alexy, 2002, p. 147).

For Günther, fundamental rights are intrinsic to the legitimacy of the legal system as they empower citizens to participate actively in the legal discourse (Günther, 1993, p. 50). This participation ensures that legal norms are not only inclusive but also reflective of the diverse perspectives within society. Alexy, while agreeing on the importance of fundamental rights, focuses on their procedural balancing to resolve conflicts effectively (Alexy, 2002, p. 150). He argues that this approach ensures that all rights are considered and weighed appropriately, maintaining the system's integrity and fairness.

Both scholars agree on the necessity of integrating moral normativity into the legal framework. Günther argues that legal norms must be continuously evaluated through public discourse to ensure they align with moral and rational standards (Günther, 1993, p. 230). Alexy

similarly contends that the external moral justification of legal norms is crucial for their legitimacy, advocating for a legal system that is both objective and sensitive to ethical considerations (Alexy, 1992, p. 78).

Günther's emphasis on moral normativity involves a continuous process of ethical reflection and public engagement (Günther, 1993, p. 235). He believes that this ongoing dialogue ensures that legal norms are not only rational but also morally sound. Alexy complements this view by advocating for a rigorous external moral justification of norms (Alexy, 1992, p. 82). He argues that such justification is essential for maintaining the ethical integrity of the legal system, ensuring that laws are both objectively rational and ethically defensible.

In terms of legal conflict resolution, Günther and Alexy both advocate for dialogical approaches but with differing emphases. Günther emphasizes a more inclusive, participatory process where all affected individuals can present and challenge arguments equally (Günther, 1993, p. 89). Alexy, while also supporting dialogue, places greater emphasis on the structured weighing of principles, ensuring transparency and rationality in resolving conflicts (Alexy, 2002, p. 132).

Günther's approach to conflict resolution involves creating a space where all voices are heard and considered (Günther, 1993, p. 92). He believes that this inclusivity fosters a more democratic and legitimate process. Alexy, on the other hand, focuses on the procedural aspects of conflict resolution, arguing that structured weighing of principles ensures that decisions are made transparently and rationally (Alexy, 2002, p. 135). This method aims to balance inclusivity with the need for a clear and fair decision-making process.

The ongoing review and critique of legal norms are central to both theories. Günther, influenced by Habermas, stresses that the legitimacy of legal norms hinges on their capacity to withstand continuous public scrutiny and rational discourse, ensuring they evolve with societal changes (Günther, 1993, p. 225). Alexy also values the critical review of norms, asserting that the process of principle weighing should be ongoing, striving for the best possible solutions in legal conflicts (Alexy, 2002, p. 168).

Günther's focus on continuous review is based on the belief that legal norms must adapt to societal changes to remain relevant and effective (Günther, 1993, p. 230). He argues that public scrutiny ensures that norms are constantly reassessed and updated, maintaining their legitimacy. Alexy, in turn, emphasizes that the process of principle weighing should be an ongoing exercise, ensuring that legal norms are continually evaluated and adjusted to achieve the most just outcomes in the face of new conflicts and societal developments (Alexy, 2002, p. 172). This approach highlights their shared commitment to a dynamic and responsive legal system.

In summary, while Günther and Alexy share a commitment to integrating rationality and normativity into legal theory, their approaches differ significantly in terms of methodology and

emphasis. Günther's focus on discursive practices and democratic participation contrasts with Alexy's structured, procedural approach to legal argumentation and principle weighing. These differences underscore the richness and complexity of contemporary legal theory, illustrating the diverse ways in which rational and normative principles can be applied to achieve justice and legitimacy in legal systems.

KLAUS GÜNTHER VERSUS ROBERT ALEXY

The methodological divergence between Günther and Alexy becomes apparent when examining their approaches to legal legitimacy. Günther critiques Alexy's principle of weighing, arguing that it lacks the consistency needed to ensure just outcomes (Günther, 1993, p. 275). He believes that a discursive practice, where all individuals affected by the law can participate equally, provides a more robust foundation for legitimacy (Günther, 1993, p. 280).

Günther's critique is rooted in his belief that legal legitimacy must be continuously validated through public engagement and rational discourse (Günther, 1993, p. 285). He argues that Alexy's approach, while rational, may not fully capture the dynamic and participatory nature of democratic legal systems. Instead, Günther advocates for a more fluid and inclusive process, where the legitimacy of norms is derived from the ongoing dialogue between citizens and legal authorities, ensuring laws remain relevant and reflective of collective rationality.

Alexy, in contrast, defends the necessity of principle weighing in "A Theory of Constitutional Rights." He posits that weighing principles is crucial for resolving conflicts between fundamental rights, arguing that this method offers the flexibility needed to address the complexities inherent in legal situations (Alexy, 2002, p. 114). This highlights a core methodological difference: Günther's preference for inclusive discourse versus Alexy's structured weighing of principles (Alexy, 1989, p. 65).

Alexy's defense of principle weighing is based on the need to balance competing rights and interests systematically and fairly (Alexy, 2002, p. 120). He contends that without a structured approach to weighing principles, legal decisions could become arbitrary or inconsistent. By rational procedures and clear guidelines, Alexy seeks to ensure that the legal system can handle complex cases effectively, providing just resolutions that uphold the integrity of fundamental rights.

A critical distinction in their theories is how they conceptualize normativity. Günther, influenced by Habermas, sees normativity as emerging from communicative action among agents, where norms are legitimized through ongoing public discourse (Günther, 1993, p. 305). Alexy, on the other hand, argues that normativity can be structured objectively through a system of principles guiding the application of law (Alexy, 1989, p. 66). This contrast underscores Günther's procedural

and participatory approach compared to Alexy's structural and objective methodology (Alexy, 2002, p. 152).

Günther's procedural approach emphasizes the role of public discourse in shaping and legitimizing legal norms (Günther, 1993, p. 310). He believes that the continuous interaction between citizens and legal institutions ensures that laws remain flexible and adaptable. Alexy's structural approach, however, prioritizes the establishment of clear, objective principles that guide legal application, aiming to provide a stable and consistent framework for legal decision-making (Alexy, 2002, p. 155). This divergence highlights their different priorities in ensuring the legitimacy and effectiveness of legal norms.

Günther's critique of principle weighing centers on the potential for arbitrariness. He argues that Alexy's method may compromise the protection of individual rights due to its inherent flexibility (Günther, 1993, p. 345). Günther advocates for a more discursive approach, where the legitimacy of norms is continuously validated through public engagement (Günther, 1993, p. 350). Alexy counters this by asserting that principle weighing is essential for resolving rights conflicts rationally, providing adequate safeguards against arbitrariness (Alexy, 2002, p. 182).

Günther is concerned that without constant public scrutiny and discourse, principle weighing could lead to subjective and inconsistent legal outcomes (Günther, 1993, p. 355). He believes that an ongoing dialogue involving all stakeholders is crucial to ensure that legal norms are applied justly and equitably. Alexy, however, maintains that a structured weighing process, guided by clear rational principles, provides a reliable method for resolving complex legal conflicts, minimizing the risk of arbitrary decisions (Alexy, 2002, p. 185).

The procedural focus in Alexy's theory is a significant point of contention. While Günther emphasizes the importance of democratic participation and discursivity in legitimizing legal norms, Alexy highlights the need for clear, objective procedures that ensure rational application of principles (Alexy, 2002, p. 291). This difference in focus illustrates their distinct priorities in legal theory: inclusivity and flexibility for Günther versus structure and objectivity for Alexy (Fraser, 2003, p. 178).

Günther's insistence on democratic participation is grounded in the belief that legal norms must reflect the collective rationality of the community (Günther, 1993, p. 295). He argues that inclusive discourse ensures that all perspectives are considered, leading to more legitimate and effective laws. Alexy, conversely, emphasizes the need for a structured legal framework that can consistently apply principles to achieve fair and just outcomes (Alexy, 2002, p. 295). This procedural focus seeks to balance rationality and fairness, ensuring that the legal system operates effectively.

Günther's emphasis on democratic engagement contrasts sharply with Alexy's procedural rationality. Günther believes that laws must be legitimized through the active and equal participation

of all citizens, ensuring that legal norms reflect collective rationality (Günther, 1993, p. 112). Alexy, however, maintains that a well-structured legal system, guided by clear principles and rational procedures, is essential for fair and consistent application of the law (Alexy, 2002, p. 168).

For Günther, the active involvement of citizens in legal processes is crucial for maintaining the legitimacy of legal norms (Günther, 1993, p. 115). He argues that this engagement ensures that laws are not only rational but also democratic, reflecting the values and needs of the community. Alexy, on the other hand, focuses on the procedural aspects, arguing that a structured legal framework is necessary to ensure that laws are applied consistently and fairly, thus maintaining their legitimacy (Alexy, 2002, p. 171).

Another key difference is their approach to resolving legal conflicts. Günther advocates for a dialogical process where all agents can participate equally in the argumentation (Günther, 1993, p. 178). In contrast, Alexy supports a more structured approach, where principles are weighed transparently and rationally to resolve conflicts (Alexy, 2002, p. 168). This methodological divergence highlights their differing views on the role of discourse and rationality in legal practice.

Günther's dialogical approach to conflict resolution emphasizes the importance of inclusivity and equality in the legal process (Günther, 1993, p. 182). He believes that all affected parties must have the opportunity to present and challenge arguments, ensuring that decisions are democratic and legitimate. Alexy, however, stresses the need for a clear and structured process that can rationally weigh competing principles, ensuring that legal conflicts are resolved fairly and consistently (Alexy, 2002, p. 172). This structured approach aims to provide a balanced and just resolution to legal disputes.

Günther's approach to normativity emphasizes continuous engagement and public discourse as means of legitimizing legal norms (Günther, 1993, p. 225). He argues that norms must be constantly evaluated and re-evaluated through open dialogue, ensuring their legitimacy and adaptability (Günther, 1993, p. 230). Alexy, in contrast, advocates for a normative structure based on principles that guide the objective and rational application of legal rules (Alexy, 2002, p. 320). This fundamental difference underscores each theorist's approach: Günther values democratic participation, while Alexy prioritizes normative clarity and structure (Alexy, 1989, p. 360).

Günther believes that the ongoing public evaluation of norms ensures that they remain relevant and reflective of societal values (Günther, 1993, p. 235). He argues that this continuous dialogue allows for the adaptation of legal norms to new challenges and changes within society. Alexy, on the other hand, emphasizes the importance of a clear normative framework that provides a stable foundation for legal decision-making (Alexy, 2002, p. 325). This framework is designed to ensure that legal norms are applied consistently and rationally, maintaining their legitimacy and effectiveness.

Fraser (2003, p. 450) and Bohman (1996, p. 470) provide insights into these differing approaches. Fraser posits that Günther's discursive method fosters a more inclusive legal system, allowing continuous contributions from all citizens, thus ensuring norms remain relevant and democratic (Fraser, 2003, p. 455). Bohman, however, underscores extension of Alexy's ideas. By incorporating elements of discursivity and participation, Günther aims to strengthen the legitimacy and normativity of the legal system, promoting greater democratic participation and more robust protection of fundamental rights (Günther, 1993, p. 250). This approach offers a more holistic and participatory view of law, a rational argumentation and active participation of agents in the construction and application of legal norms (Habermas, 1996, p. 198).

To further elucidate this perspective, Günther's theory underscores the necessity of engaging all stakeholders in the legal discourse, ensuring that laws are not only rational but also representative of the collective will (Günther, 1993, p. 255). This continuous engagement fosters a sense of ownership and accountability among citizens, thereby enhancing the overall legitimacy of the legal system.

By contrast, Alexy's model, with its emphasis on principle weighing, offers a structured framework for resolving conflicts but may fall short in capturing the dynamic and participatory aspects of democratic lawmaking (Alexy, 2002, p. 260). While his approach ensures consistency and fairness, it may lack the flexibility needed to adapt to evolving societal values and norms.

Günther's focus on democratic participation is further supported by the work of legal scholars who argue that inclusive practices lead to more equitable and just legal outcomes. For instance, Fraser (2003, p. 270) highlights that Günther's approach ensures a continuous dialogue between citizens and legal authorities, promoting transparency and adaptability in the legal system. This ongoing interaction allows for the legal norms to be constantly reassessed and refined in response to new challenges and societal changes.

Moreover, the integration of moral and ethical considerations into the legal framework, as emphasized by Günther, aligns with broader theories of justice and fairness in law. He contends that laws must be subjected to continuous moral scrutiny through public discourse, ensuring that they remain aligned with the evolving ethical standards of society (Günther, 1993, p. 275). This perspective is shared by commentators such as Rorty, who argue that the inclusion of diverse moral viewpoints is essential for the legitimacy of legal norms (Rorty, 1991, p. 280).

In summary, while Alexy's principle of weighing provides a valuable framework for addressing conflicts between fundamental rights, Günther's emphasis on discursive practices and democratic participation offers a more comprehensive and adaptable approach to legal legitimacy. By integrating continuous public engagement and ethical reflection into the legal process, Günther's theory promotes a more dynamic and responsive legal system that is better equipped to handle the

complexities of modern society. This dual approach of rational discourse and moral justification ensures that laws are not only fair and consistent but also reflective of the collective will and ethical standards of the community.

CONCLUSION

Günther drew inspiration from Jürgen Habermas's theory of discourse, which emphasizes the significance of rational communication for the legitimacy of social norms (Habermas, 2015, p. 58). Additionally, Günther integrated aspects of John Rawls's theory of justice, which underscores the necessity of just principles of distribution and equality, grounded in an ideal social contract (Rawls, 2005, p. 45). These theoretical elements equipped Günther with the foundational tools to develop his approach.

Throughout his academic career, Günther synthesized these influences to create a conception of law that prioritizes rational argumentation and deliberation as central to the legitimacy of legal norms (Günther, 2016, p. 89). He contends that law should not be perceived merely as a set of rules imposed authoritatively but as a dynamic and interactive system where norms are continuously revised and legitimized through rational, inclusive discourse (Günther, 2016, p. 92). Adopting this perspective, Günther proposes a robust alternative to traditional positivist theories, which often overlook the role of communication and deliberation in the formation of law (Günther, 2016, p. 100).

Influenced profoundly by Karl-Otto Apel's universal pragmatics, Günther asserts that ethical argumentation must be universally valid and acceptable to all rational beings (Apel, 2011, p. 74). This convergence of ideas provided Günther with a solid theoretical basis to conceive discursive legal rationality as a model of rational and inclusive justification of legal norms (Günther, 2016, p. 115). Integrating discursive and pragmatic elements, Günther offers an innovative perspective on the legitimacy of legal norms.

Günther's ideas on discursive legal rationality have been met with both enthusiasm and criticism by the academic community. Some scholars have praised his theory for its ability to integrate democratic principles into law, ensuring that legal norms are not merely technocratic but also socially legitimized (Günther, 2016, p. 110). However, others have pointed out practical limitations of the theory, questioning whether discursive processes can be effectively implemented in complex and bureaucratic legal systems (Rosenfeld, 2017, p. 124).

Scientific articles have debated the concept of discursive rationality, exploring its theoretical and practical implications. In "Discursive Rationality in Legal Theory," Robert Alexy argues that Günther's theory offers a solid foundation for the legitimacy of legal norms but cautions about the challenges of operationalizing these principles in real legal contexts (Alexy, 2016, p. 115). Nancy Fraser, in her work on social justice, criticizes Günther's approach for not sufficiently accounting for

power imbalances that can affect discursive processes (Fraser, 2018, p. 96). These discussions reveal a rich diversity of opinions on the feasibility and limits of the concept. Nonetheless, many scholars defend Günther's concept as a necessary response to the limitations of traditional legal theories. By an inclusive discourse, Günther paves the way for a legal system that is continually shaped and adapted by the voices of those it aims to serve (Günther, 2016, p. 102).

Advocates of Günther's theory argue that discursive rationality is particularly relevant in contemporary contexts, where social complexity and the plurality of values demand more dynamic and participatory approaches to lawmaking (Günther, 2016, p. 108). In increasingly diverse societies, the ability to include different perspectives and experiences in the legal process is deemed essential for ensuring the legitimacy and justice of legal norms (Alexy, 2016, p. 120). Moreover, Günther's discursive approach is seen as an effective method for addressing social and legal conflicts, as it promotes dispute resolution through dialogue and rational argumentation rather than unilateral decision-making (Teubner, 2017, p. 137). This methodology not only strengthens the legitimacy of legal norms but also fosters a greater sense of social cohesion and solidarity (Teubner, 2017, p. 140).

These changes include creating mechanisms that facilitate citizen participation and ensure that all voices are heard and considered in the legal decision-making process (Habermas, 2020, p. 82). Structures must be designed to minimize power inequalities and ensure that discursive processes are genuinely inclusive and representative (Fraser, 2018, p. 99). Günther's approach underscores the need for a legal system that not only regulates but also actively promotes justice and equity, adapting to the needs of complex and diverse societies (Günther, 2016, p. 89).

However, critics of Günther's theory point out that the practical application of discursive rationality may face significant obstacles. Implementing effective discursive processes in highly bureaucratic and complex legal systems can be challenging, raising questions about the feasibility of ensuring truly inclusive and representative participation (Rosenfeld, 2017, p. 124). Additionally, concerns about addressing power inequalities that can affect the legitimacy of discursive processes are raised, as noted by Nancy Fraser in her work on social justice (Fraser, 2018, p. 96). By emphasizing a discourse and deliberation, his concept of discursive rationality redefines how we understand legitimacy and justice in law (Günther, 2016, p. 116). Klaus Günther's work represents for the field of law an innovative vision that challenges traditional approaches and proposes a more open and democratic legal system (Günther, 2016, p. 114).

To conclude, Günther's theory highlights the importance of considering social and cultural contexts in the formation of legal norms, recognizing that justice cannot be achieved without a deep understanding of the realities and needs of individuals and social groups (Günther, 2016, p. 120). This integrative perspective is essential for developing a legal system that not only regulates but actively promotes justice and equity in all its dimensions (Habermas, 2019, p. 70).




Alexy and his advocates, while acknowledging the contributions of discursive rationality, demonstrate that the theory of legal argumentation, based on these principles, provides a valuable approach to addressing contemporary challenges in the field of law. By integrating principles of rational deliberation and active citizen participation, Günther's theory not only promotes the legitimacy of legal norms but also contributes to a more just and equitable legal system.

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Social networks analysis: A study on the linkage of relations and the hierarchy in the public sector

 <https://doi.org/10.56238/sevned2024.014-013>

Paulo Vanderlei Cassanego Junior¹ and Cristiane Ferreira de Souza Araújo²

ABSTRACT

The study used Social Network Analysis (SNA) to map interactions among public servants at the City Council of Sant'Ana do Livramento. A quantitative approach was employed, collecting data via questionnaires from 133 public servants, with 108 valid responses. The data were processed using Gephi 0.9.1 software to construct networks of information, friendship, and trust. Three networks were mapped: information exchange, friendship, and trust. The analysis used metrics such as degree centrality, betweenness centrality, closeness centrality, and eigenvector centrality. The information exchange network included 143 public servants with 1235 connections and a density of 6.1%. Key nodes, such as Councilor Ulberto Navarro, showed high capacity for information exchange and highlighted the importance of certain public servants in coordinating and controlling information within the network. SNA is valuable for understanding social dynamics in a public organization. Identifying informal leaders and analyzing networks of friendship, information, and trust provide crucial insights for enhancing communication and collaboration within the institution.

Keywords: Social Network Analysis, Public Management, Interpersonal Relationships.

¹ PhD in Business Administration
Federal University of Pampa

² PhD student in Production Engineering
Federal University of Rio Grande do Sul

INTRODUCTION

The analysis of social networks (ARS) we based on mapping, graphic formalization and quantification of interactions (edges) between actors (nodes) in a network, making it possible to survey the contents and particularities arising from these relationships. It consists of understanding social structures through relational data that we based on the ties and connections between agents and their role in the network, allowing us to know how a small group and its interaction become patterns for the creation of larger groups (Granovetter, 1973; Wasserman & Faust, 1999; Recuero; Bastos; Zago, 2015; Liu et al., 2017).

According to Scott (2000), the basis for understanding social networks lies in Moreno's theory (1934), which significantly contributed to the representation of the formal properties of social configurations, developing methods for measuring and analyzing the roles of individuals and groups, from the point of view of the interaction, the conglomerate and the prediction of future behavior. Mapping the structures allows the researcher to visualize communication channels and identify leaders and connections between people. The sociogram/graph represents the forces of attraction, repulsion, and indifference in groups (Bastos & Santos, 2007).

According to Kuipers (1999), there are two primary organizational networks: formal and informal networks. The formal social network consists of connections or ties prescribed between formal or standardized social positions, unlike informal social structures, which are not explicit or defined by organizations. We based on interactions that depend on the personal attributes of the participants.

For Silva et al. (2020), understanding the behavior of actors and their information flows within the organizational context is essential to identify the emerging potential of formal and informal leadership. Institutions and managers that support social interactions outside the workgroup encourage creativity among members, who, connected to different sources outside their group, cultivate weak, cross-border and cross-functional ties that can generate new ideas and solutions (Kim et al., 2016).

Social network theory sees organizations as a nexus of formal and informal social relationships between a set of organizational actors (Borgatti et al., 2009). These social ties we saw as the primary sources of benefits for individuals, including non-redundant information, social support and status, as well as responsibilities (Mehra et al., 2001; Duffy et al., 2002; Brass et al., 2004; Labianca & Brass, 2006; Borgatti et al., 2009; Kilduff & Brass, 2010; Ellwardt et al., 2011; Marineau et al., 2018). The awareness of a community of interests and values among people has been the basis for understanding the networks of relationships. Their participation has involved rights, responsibilities and various levels of decision-making (Aldrich & Zimmer, 1986).

In this context, as a way to understand formal and informal social relations, the following research problems were elaborated:

Q1. How are formal and informal social relations established in a public institution?

Q2. What are the implications of the intertwining of these relationships in the institution's current hierarchical environment?

Thus, this research aims to analyze formal and informal interpersonal relationships and their implications in the hierarchical environment established in a public institution of municipal management.

The literature points to controversies between sharing community mechanisms on social networks and their benefit for disseminating information (Liang & Fu, 2016). In addition, studies that identify influential nodes in complex networks capable of demonstrating advantages and disadvantages on the interactions and impacts of relationships in the workplace are emerging but scarce, as mentioned in the works of Wang, Du & Deng (2017); Khazanchi, Sprinkle, Masterson & Tong (2018) and Silva et al. (2020).

We noted that works favor the analysis of intra-organizational informal networks, such as Krackhardt & Porter (1986), Kuipers (1999), Cross & Prusak (2002), Kilduff & Tsai (2003), Silva (2003), have in common is the view that informal networks are invisible and powerful tools in the organization, as much of the work is carried out based on informal contacts. For Bastos & Santos (2007), when informal systems operate within organizational boundaries, they make information circulate, complementing formal channels, and the understanding of “the way things happen” can have a significant influence on organizational behavior (Bastos & Santos, 2007).

Furthermore, it is noteworthy that the potential of the methodology of social network analysis does not replace other attributes, such as the study of the institution itself or the different dimensions and perspectives we offered to these researchers. However, we expected that this tool provides a wide range of visual aspects, creating new possibilities for analysis.

BACKGROUND

INFORMAL SOCIAL NETWORKS FROM AN ORGANIZATIONAL PERSPECTIVE

In studies on social networks, we give informal relationships to the detriment of hierarchical structures (Régis et al., 2007). The work produced through networks of informal relationships constitutes a way of human organization present in the daily life of organizations in their different levels of structure (Marteleto, 2001).

For Regis et al. (2007), unlike formal organizations, studies on networks do not consider, a priori, a presumption of hierarchy. We noted that the analysis of network structures does not exclude the possibility of power and dependency relationships in internal associations and in relationships

that go beyond networks (Marteleto, 2001; Régis et al., 2007). In this way, it is possible to identify common or widely shared elements in networks, such as connection, bonding, and integration (Loiola & Moura, 1997; Minhoto & Martins, 2001; Bastos & Santos, 2007).

The relational dimension of a social network focuses on the role of direct ties between actors about the content transacted in interactions and their diversities, which are: friendship, information, respect, trust, norms, sanctions and identification (Nahapiet & Ghoshal, 1998; Inkpen & Tsang, 2005).

The mapping of networks makes it possible to identify various transactions, such as friendship, information exchange, trust, party affiliation, and mentoring. A social bond between two people based on a single role, we described as uniplex or mono-stratified (Boissevain, 1974). A social bond between two people we called multiplex or multi-tiered when it covers multiple parts. There is a tendency for uniplex calls (e.g., Maria is Ana's colleague at the company) to become multiplex (ex: Maria is Ana's colleague at the company and they have become friends) if they persist over time, as well as a tendency for multiplex calls be stronger than uniplex links, as the overlapping roles reinforce each other (Marinho-da-Silva, 2003).

Kuipers (1999) shows that some researchers distinguish between qualitatively different types of ties based on the kind of resource that flows through the network. The author considers that the interaction between individuals in a network is specific to how we formed and the ties we used to transfer any resource.

Kuipers is one of the pioneers in the approach to friendship, information and trust networks. For her, the content transacted on each of these types of networks is specific. Kuipers (1999) definitions for these three types of network are:

- Information network: it is an informal network in which the transacted content concerns what is happening in the organization as a whole about opportunities for advancement, decision-making processes and organizational success. Such information typically affects all members of the organization;
- Friendship network: it is an informal network, based on the exchange of friendship and socialization, which provides support and improves self-esteem, in addition to encouraging certain behaviors that increase acceptance among groups within the organization;
- Trust network: it is a network of informal ties, in which an actor takes risks by giving up control of the results, by accepting dependence on another actor, without the force or coercion of the relationship, whether contractual, structural, or legal;

Costa (2017) says that the bonds of friendship are gaining, in the political process, a new characteristic of relationship and social feeling, armed with economic interests and often affirmative

contracts between peers. For Marconi (2013), the political process is where the “political structure we characterized by its trends, which allow its easy identification about the broader society,” it is often found between the lines of interpersonal supplies and congestion of exchanges social.

In this way, we intended to understand how interpersonal social relations occur in the environment of the City Council of Sant’Ana do Livramento, in the spheres of exchange of information, friendship and trust, as proposed by Kuipers (1999), in which the actors they are exposed to all sorts of relationships with feelings and interests that may or may not extrapolate the organizational environment.

METHODOLOGICAL PROCEDURES

We determined that Social Network Analysis (ARS) is the most appropriate method for developing this research. We based on mapping, graphic formalization and quantification of interactions (edges) between actors (nodes) of a network, making it is possible to survey the contents and particularities arising from these relationships (Wasserman & Faust, 1999). This research has a quantitative approach, as it sought to specify and analyze characteristics of a population numerically (Richardson, 2012; Sampieri, Collado & Lucio, 2013). We adopted descriptive research’s kind, as according to Gil (2010), type’s research has as its objective the description of the characteristics of a given population or phenomenon or the simple identification.

For data collection, we defined by the application of a questionnaire (Zancan, Santos & Campos, 2012), we clarified that the questionnaire prepared based on Kuipers (1999) is composed of three blocks: in the first, institutional information is requested and functional, for purposes of identifying the profile of respondents. There are five multiple-choice questions in the second block to verify which legislative actions are developed together (between offices). In the third block, a nominal list of servers we presented, where respondents indicated which people (co-workers) they have social relationships with or have already had at some point, observing the three aspects of the relational dimension proposed by Kuipers (1999): exchange of work, friendship and trust information.

At the end of each questionnaire, there was a nominal list containing the names of all public servants organized by sector of work, and each name we assigned a number, this number being responsible for identifying and filling out the questionnaire.

This questionnaire we applied to public servants of the legislative house, namely: councilors, political agents (positions in commission) from councilors’ offices, interns and permanent servants. Thus, considering the data presented by the institution’s Personnel Department, 133 civil servants from the legislative house were deemed to answer the questionnaire.

It is noteworthy that questionnaires we delivered in person we being collected later, according to a deadline individually agreed with each of the respondents or according to a deadline stipulated by the head of the cabinet. However, due to the general difficulty, we decided to apply the questionnaires one by one, individually with each employee, although some refused to answer. Others claimed that they could not at the time, as they were busy (some public servants approached them. If more than 5 (five) times at different times) until the last day stipulated for collection, we answered 112 questionnaires, of which 04 were null and 108 were valid.

The decision of questionnaires nullity defined a priori, was because the third block they not answered in its entirety or that they answered with the respondent stating relationship in any aspect “with everyone” since it was necessary to reflect with which people the respondent had had a relationship in the last six months and “everyone” we considered a non-valid answer.

Regarding the social network mapping, the data provided by the respondents we listed in a relationships matrix where the representation of the relationship between the nodes and their connections (in this case, each pair of nodes there is a connection is represented in a spreadsheet line) when there is (Recuero, Bastos & Zago, 2015), as shown in Table 1.

Table 1 - Example of a matrix of relationships

Friends	
Marcia	Maria
Marcia	Felipe
Raquel	Felipe
Ana	Felipe
Ana	Marcia

Source: Adapted from Recuero et al. (p. 46, 2015).

We processed the network on Gephi 0.9.1 software and we build nodes and edges. Each relational dimension, e.g., information, friendship and trust.

We created a different matrix, originating three distinct networks. According to Recuero et al. (2015), we based the ARS on specific metrics built over the years by various researchers and works to analyze these networks, node and network metrics used.

Therefore, aiming to analyze the relational dimension of social networks mapped in their properties and characteristics, identifying communities or groups (clusters), as well as verifying their density (network metrics) and the centrality of each node, the following ARS metrics will be used, confirmed with the aid of the data laboratory-generated by the Gephi 0.9.1 software, cited and conceptualized in Table 2, below:

Table 2 - Social Network Analysis Metrics to we used in the research

Metrics		Concepts
Node Metrics	Centrality degree	A measure of the number of connections that each node has with the other nodes in the network, ranging from 0 to the maximum possible connections number (Shaw, 1964).
	Betweenness centrality	The measure of how much each node connects different groups (which do not link directly), serving as a “bridge” between them and reducing distances in the network (Freeman, 1979).
	Closeness centrality	The measure of close each node is to the other nodes in the network, considering the average distance between them. The smaller the Closeness measure, the closer the node is to the others (Sabidussi, 1966).
	Eigenvector centrality	A measure of central each node’s connection is in the network. It considers the centrality of the non-direct links of each node (Bonacich, 1972).
Network Metrics	Density	The network interconnection measure refers to the number of identified connections about the total number of possible connections: the density greater and cohesion of the network (Borgatti et al., 2009).
	Modularity	The separation of network nodes by communities, e.g., nodes groups densely connected but fragilely with the other nodes. (Blondel et al., 2008).

Source: elaborated by the authors, based on Recuero et al. (2015).

RESULTS AND DISCUSSION

When applying the data collection instrument, 108 valid questionnaires, where three networks of interpersonal relationships we mapped: the networks of information exchange, friendship and trust, and each network we analyzed from five perspectives: Degree Centrality, Closeness, Betweenness and Autovector as can be seen in the graphs in Figures 1, 2 and 3.

We noted that the most prominent order nodes in each network followed the Degree Centrality metric, in which the nodes we organized from the highest values resulting in the degree centrality metrics, except the Closeness centrality measure, which according to Sabidussi (1966), the smaller the Closeness measure, the closer the node is to the others.

In cases of repeated values, the order of classification of the most prominent nodes in the network followed the alphabetical order from A to Z, while in the others, the order of highest centrality value was followed by the lowest.

Also, the graphic representation shown in the graphs, in which each node and edge color indicates the community to which it belongs (BLONDEL et al., 2008), as well label size reflects their importance, the higher label its the representative node within the network or the cluster to which it belongs, the meaning of the strength/representativeness/influence of this node will depend on the metric analyzed in each situation.

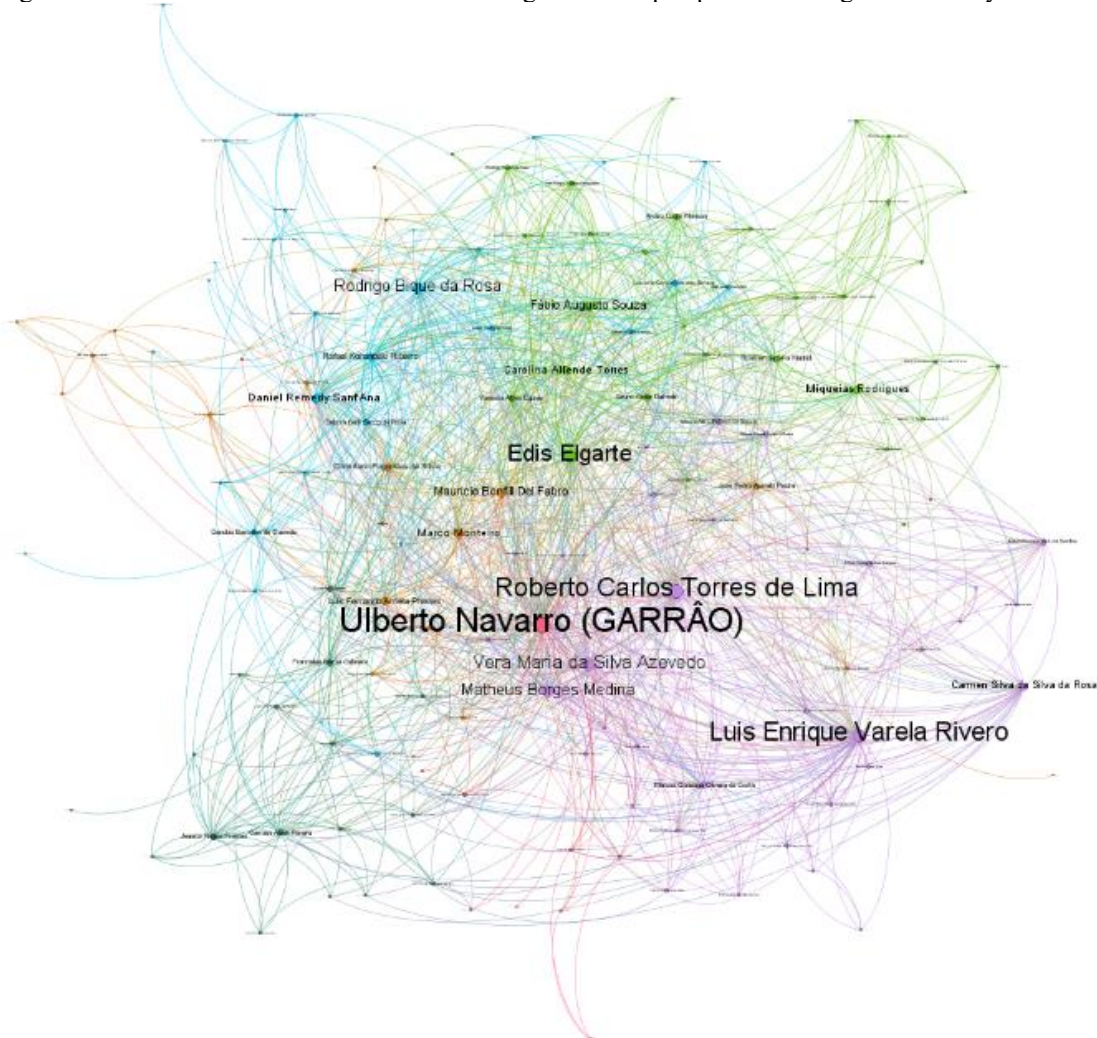
ANALYSIS OF SOCIAL NETWORKS FROM THE PERSPECTIVES OF THE EXCHANGE OF INFORMATION, FRIENDSHIP AND TRUST

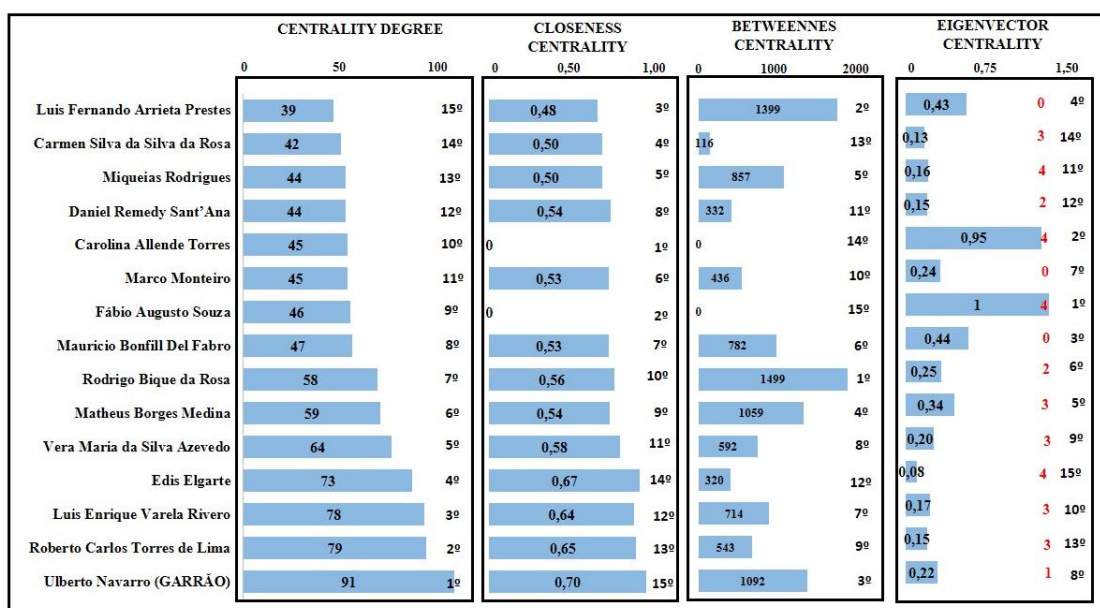
Thus, after the application of the questionnaire to map the networks and their due investigation, there is a social network for the exchange of information between public servants of the Municipal Council of Sant’Ana do Livramento, which we made up of 143 public servants. In this

way, we saw that 1235 edges interconnect 143 nodes or actors, that is, connections between the network nodes, signaling a directed graph.

When analyzing the density metric (BORGATTI et al., 2009), we noticed that it resulted in a value equal to 0.061. We said that it is a 6.1% dense or cohesive network. That is, of the possible connections between 6.1% network actors are effective. The modularity metric (BLONDEL et al., 2008) resulted in a value equal to 0.232 and distinguished 05 different communities. These communities we indicated by green, blue, lilac, orange and gray in the graph. We understood that these 05 large groups determine the behavior of the network. That is, they reflect how the actors they organized. The nodes belonging to each of these modules are not very densely connected. However, more fragile or null with the other actors belonging to the other clusters in the network. The graphical representation of the social network mapped in Figure 1 we presented below:

Figure 1 - Social network for information exchange from the perspective of Degree Centrality Metrics





Source: Prepared by the author with the help of Gephi Software 0.9.1.

The results in Figure 1, according to the degree centrality metric, the public servant (political agent) that connects more public servants in the interpersonal relationship of information exchange is Councilor Ulberto Navarro (GARRÃO) with 91 connections, followed by parliamentary advisor Roberto Carlos Torres de Lima, with 79 links, and Cabinet Coordinator Luis Enrique Varela with 78 direct connections. We noted that the three actors mentioned belonging to the same Office, and these actors (public servants) play an essential role in the network, having an excellent capacity for exchanging information with the most significant number of direct connections with other actors in the network. Regarding the Betweenness degree, press advisor Rodrigo Bique da Rosa and parliamentary advisor Luis Fernando Arrieta Prestes appear in 1st and 2nd place, with 1499 and 1399 degrees. That means that the more he finds themselves in a situation where other public servants have to go through them to reach other actors, the greater capacity for coordination, control and circulation of information on the network (LEMIEUX and OUIOMET, 2004), according to the graph in Figure 1. We have seen the press officer circulates among all the offices to collect the information we can disclose, thus fulfilling his function, contributed to the degree of The Betweenness of this actor was high, as well as that of the parliamentary advisor Luis Fernando Arrieta Prestes, who was in charge of the President's Office in 2018, in which Councilor Danúbio Barcellos was presiding. This fact may have influenced the Betweenness capacity of this actor to have increased.

About the Closeness Degree, the legislative official Carolina Allende Torres and the Director Fábio Augusto Souza occupy the first place tied with 0 degrees, the parliamentary advisor Luis Fernando Arrieta Prestes with 0.48 degree, we understood that these civil servants are more influence subject. Considering that this metric proposes that the more an actor finds himself distant from other actors, the more autonomous he will be about his choice of actions (FREEMAN, 1979).

We noted that even though this node is more peripheral in the graph, it does not influence its measure of mathematical Closeness. The legislative official Carolina Allende Torres and the Director Fábio Augusto Souza understood that the role they play within the Legislative House requires rigor to comply and protocols inherent to their functions. These are influential positions requiring autonomy but rather a compliance with regulations. About the parliamentary advisor Luis Fernando Arrieta Prestes, we understood that his role before the Office of the President of the House in the 2018 term required him an authentic character of importance and adherence to the regulations to fulfill his functions.

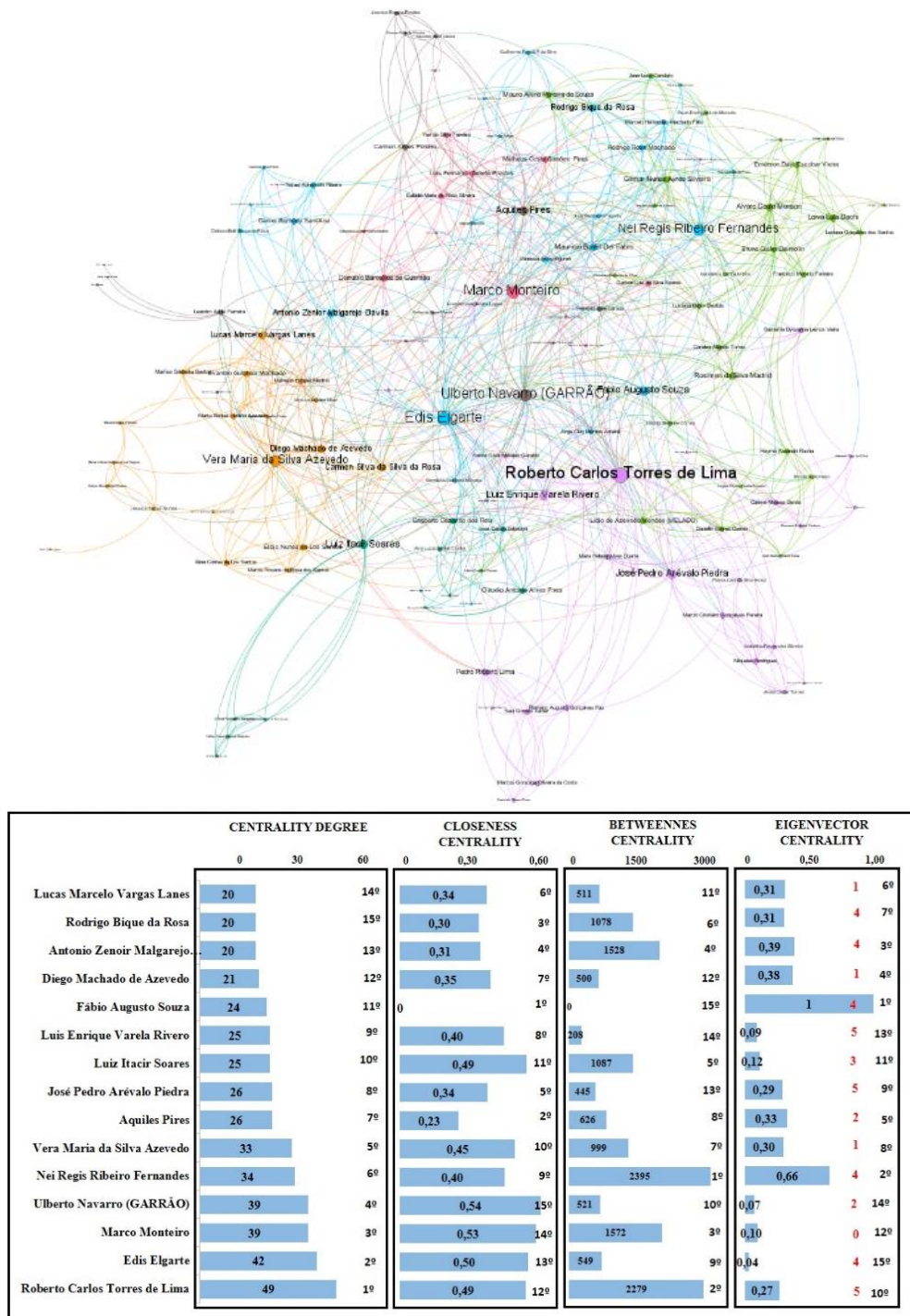
About the eigenvector centrality, we identified the director Fábio Augusto de Souza (cluster nº 4), the parliamentary advisor Luis Fernando Arrieta Prestes (cluster nº 4) and Councilor Mauricio Bonfill Galo Del Fabro (cluster nº 0), as the most prominent nodes of their clusters, that is, considering the direct and indirect connections, these political agents have an influence over the others in each group of public servants, thus increasing their prestige and power of force over the other nodes (Bonacich, 1972)

We have seen from the analysis that the director Fábio Augusto de Souza and the parliamentary advisor Luis Fernando Arrieta Prestes make up the same cluster, No. 4 and that both are representative of this group of actors that make up the information exchange network in the Legislative House.

As for the interpersonal social network of public servants of the City Council of Sant'Ana do Livramento, we said that 138 public servants form it. Thus it can be seen that there are 138 nodes or actors interconnected in the network by 786 edges, that is, connections between nodes, signaling a directed graph.

When analyzing the density metric (BORGATTI et al., 2009), we noticed that it resulted in a value equal to 0.042, which can be said to be a 4.2% dense or cohesive network, that is, the possible connections between the network actors 4.2% are adequate. The modularity metric (BLONDEL et al., 2008) resulted in a value equal to 0.393 and distinguished 07 different communities. These communities we determined by the colors green, light blue, lilac, orange, pink, brown and pool blue in the graph. We understood that these 07 large groups determine the behavior of the network. The nodes belonging to each of these modules are not very densely connected and are even more fragile or null with the other actors belonging to the other clusters in the network. The graphical representation of the social network we mapped in Figure 2.

Figure 2 - Friendship social network and the 15 most central nodes from the perspective of degree Centrality Metrics



Source: Prepared by the author with the help of Gephi Software 0.9.1.

According to the results shown in Figure 2, according to the degree centrality metric, the employee who connects the most public servants in the interpersonal friendship network of the Sant’Ana do Livramento City Council is parliamentary advisor Roberto Carlos Torres de Lima with 49 connections, followed by press advisor Edis Elgarte with 42 links and Councilor Marco Monteiro, in third place with 39 links in the network. We understood that these public servants play an essential role in the network, having the most significant number of direct connections with other actors in the

network. Interestingly, the actor Roberto Carlos Torres de Lima, who has the most considerable number of connections, had his network measurement questionnaire considered null by this researcher for not meeting the criteria specified for this research. However, the actor highlighted himself due to the indication of other actors, which reinforces the significance of this node for the network, as it also has the presence in this ranking of Councilor Ulberto Navarro (GARRÃO) in the 4th place with 39 connections and the Coordinator Luis Enrique Varela Rivero in 9th place with 25 direct links.

Regarding the degree of Betweenness of the network, parliamentary advisor Nei Regis Fernandes in 1st place with 2395 degrees, parliamentary advisor Roberto Carlos Torres de Lima in 2nd place with 2279 degrees and Councilor Marco Monteiro in 3rd place with 1572 degrees. That means that the more these public servants find themselves in a situation where other public servants have to pass through them to reach the other actors, the greater the capacity to coordinate, control and circulation information in the network (Lemieux & Ouimet, 2004), as can be seen in Figure 2.

We noticed that Councilor Marco Monteiro appeared in third place in the degree and Betweenness centrality network, which exposes the Councilor's relationship with the other nodes in the network as very representative. However, we highlighted the fact that no other member of this Councilor's Office we mentioned in the ranking of the 15 most representative nodes, which shows that the representativeness of this node may be more linked to the Personal Figure and not precisely to the position performed by this one in the Legislative House.

Regarding the Closeness Degree, we have seen that the Director of the Legislative House Fábio Augusto Souza occupies first place, Councilor Aquiles Pires and the advisor Rodrigo Bique da Rosa, with 0, 0.23 and 0.30 degrees, we understood that these civil servants are more influence subject because they have a smaller average distance measure from the most central nodes. The fact that the civil servants Fábio Augusto Souza and Rodrigo Bique da Rosa are more influenced than the others is justified because they perform their duties within the Chamber. However, about the analysis of Councilor Aquiles Pires, it is clear that the Second place in this metric shows that the Councilor's posture, always friendly and attentive to everyone's demands, reflects and highlights the figure of the Councilor in front of the network. The fact that Councilor Aquiles Pires belongs to the PT – Workers' Party, the most representative of the City Council with 04 councilors, we not considered, because even though two other Councilors, members of the bench, are among the most prominent nodes, they are not relevant in the analyzed metric.

We noted that even if this node is more peripheral in the graph, it does not influence its measure of mathematical Closeness. Another point that we highlighted is that the node with a lower degree, in this case, the director of the legislative house, is much more influenced than the second and third nodes, for example, since the average difference between the first and last is .029 degrees.

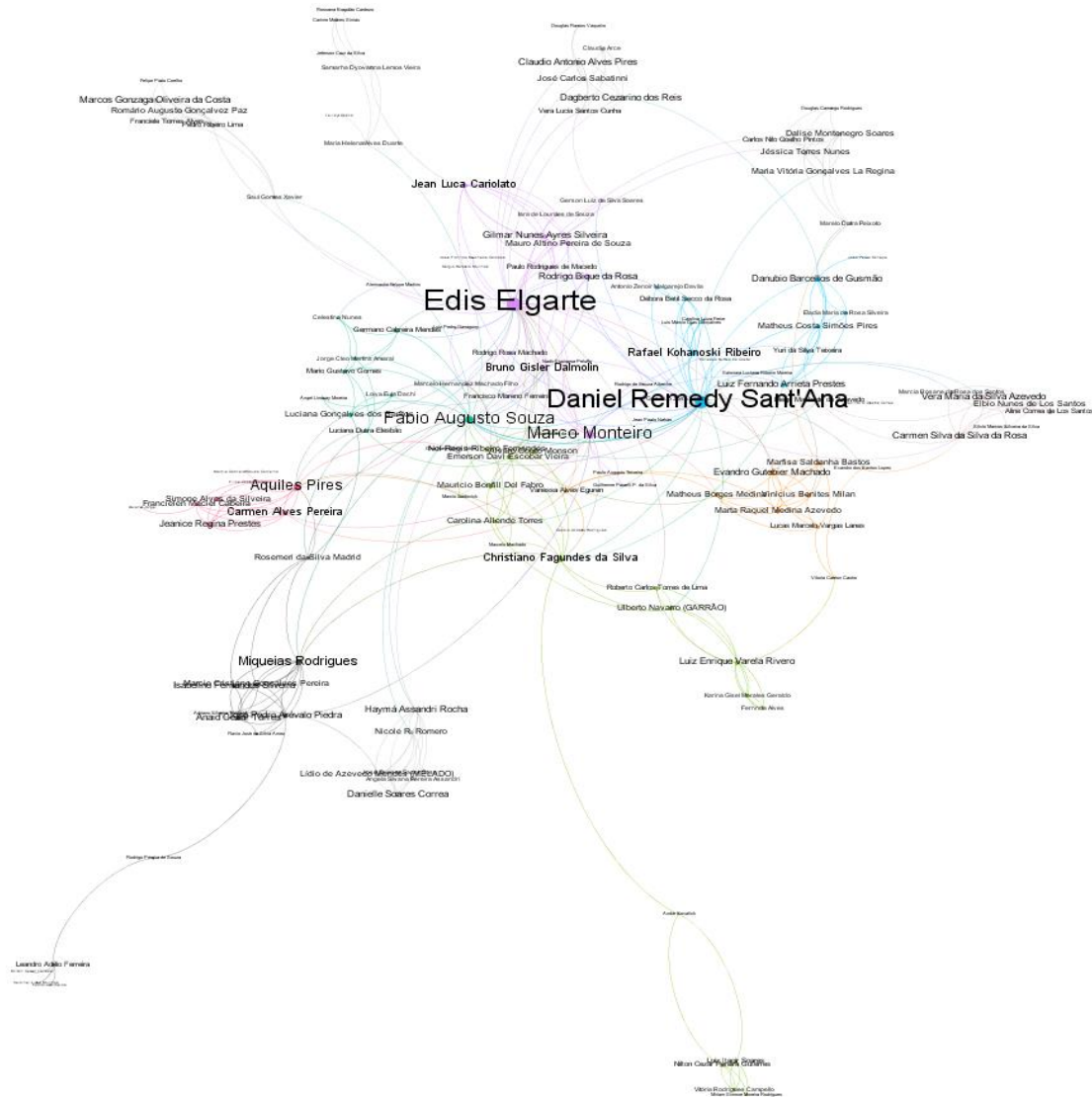
About the eigenvector centrality, we identified the director of the Legislative House Fábio Augusto Souza with degree 1 (cluster nº 4), parliamentary advisor Nei Regis Ribeiro Fernandes, with a degree of 0.66 (cluster nº 4), and Alderman Antonio Zenoir Melgarejo with a degree of 0.39 (cluster No. 4), as the most prominent nodes of the same cluster. That is, considering the direct and indirect connections, these civil servants have an influence and prestige over other civil servants within the grouping of nodes to which they belong (Bonacich, 1972).

We understood that the most representative nodes of each cluster, according to Degree Centrality, belong to the same cluster, number 4. However, none has an institutional connection as they operate in different sectors and offices, demonstrating the variability of actors within the same cluster.

Regarding the interpersonal trusted social network of public servants of the Municipal Council of Sant'Ana do Livramento, we said that we made up 135 public servants. Thus it can be seen that there are 135 nodes or actors in the network. Interconnected by 422 edges, that is, connections between nodes, signaling a directed graph.

When analyzing the density metric (Borgatti et al., 2009), we noticed that it resulted in a value equal to 0.023, being able to say that it is a 2.3% dense or cohesive network, that is, of the possible connections between the network actors 2.3% are adequate. The modularity metric (Blondel et al., 2008) resulted in a value equal to 0.609 and distinguished 14 different communities. These communities we determined by the colors blue, lilac, orange, pink, lime green, pool blue, purple, gray, brown and the other 05, less representative groups, in a decreasing grayscale in the graph. We understood that these 14 large groups determine the behavior of the network. That is, they reflect the form of organization and grouping of actors. The nodes belonging to each of these modules are not very densely connected and are even more fragile or null with the other actors belonging to the other clusters in the network. The graphical representation of the social network we mapped in Figure 3.

Figure 3 - Trusted social network and the 15 most central nodes from the perspective of degree Centrality Metrics



	CENTRALITY DEGREE		CLOSENESS CENTRALITY		BETWENNES CENTRALITY		EIGENVECTOR CENTRALITY	
	0	20	0	0,40	0	1000	0	0,75
Evandro Gutierrez Machado	10	148	0,44	118	97	128	0,34	1 68
Dagberto Cezarino dos Reis	10	120	0,35	79	148	108	0,25	8 118
Danúbio Barcellos de Gusmão	10	139	0,44	108	256	88	0,27	8 98
José Pedro Arévalo Piedra	10	150	0,52	138	334	78	0,35	2 58
Carmen Alves Pereira	11	98	0,48	128	118	118	0,64	4 38
Rafael Kohanoski Ribeiro	11	118	0,29	58	621	68	0,27	1 108
Bruno Gisler Dalmolin	11	88	0,17	38	747	48	0,17	12 138
Jean Luca Cariolato	11	108	0,23	48	1135	28	0,31	12 88
Christiano Fagundes da Silva	12	78	0,00	18	0	148	0,68	0 28
Miqueias Rodrigues	14	68	0,52	148	54	138	0,32	6 78
Aquiles Pires	17	58	0,73	158	206	98	0,6	4 48
Fábio Augusto Souza	20	48	0,00	28	0	158	1	5 18
Marco Monteiro	21	38	0,32	68	695	58	0,1	12 148
Daniel Remedy Sant'Ana	33	28	0,40	88	836	38	0,2	1 128
Edis Elgarte	38	18	0,40	98	1640	18	0,08	12 158

Source: Prepared by the author with the help of Gephi Software 0.9.1.

According to the results shown in Figure 3, according to the centrality metric of degree, the public servant (political agent) that connects more public servants in the interpersonal relationship of

trust of the Sant'Ana do Livramento City Council is the press officer Edis Elgarte with 38 connections, followed by parliamentary advisor Daniel Remedy Sant'Ana with 33 links and Councilor Marco Monteiro with 21 links in the network. These public servants play an essential role in the network, having the most significant number of direct connections with other actors in the network.

It appears that Councilor Marco Monteiro occupies 3rd place in the friendship and trust networks, which confirms the analysis carried out in the friendship network and confirms that the personal image of the Councilor, who has the profession of Federal Police, is the friendliest and trustworthy among the councilors who currently occupy the seats of the Municipality of Sant'Ana do Livramento.

Regarding the degree of Betweenness of the network, the press officer Edis Elgarte appears in 1st place, with 1640 degrees, the IT sector intern Jean Luca Cariolato in 2nd place, with 1135 degrees and the parliamentary advisor Daniel Remedy Sant'Ana in 3rd place, with 836 degrees of Betweenness, this means that the more these public servants (network actors) find themselves in a situation where public servants (other network actors) have to go through them to reach other actors, the greater it is the ability to coordinate, control and circulate information on the network (Lemieux & Ouimet, 2004), as shown in Figure 3.

It is understood from this analysis that the Betweenness capacity of public servants Edis Elgarte and Jean Luca Cariolato is due to their respective roles in the press and information technology sector, in which they communicate compulsorily with everyone in the Chamber Municipal, in what concerns the civil servant Daniel Remedy Sant'Ana, who belongs to the Office of Councilor Antonio Zenoir, we observed that in the 6th position of this metric, is his cabinet colleague, the civil servant Rafael Kohanoski Ribeiro, which shows that not only the servers act in isolation in the network of trust, but that the cabinet has a reference regarding the interpersonal relationship of trust within the City Council of Sant'Ana do Livramento, a fact that we confirmed in the network of authority /constant confidence in the next item of this analysis of results since the Councilor himself, as well as his parliamentary advisors, occupy the 13th and 14th position.

As for the Degree of Closeness, that is, how close a specific node is to the others in the network, we have seen that, in this case, the legal attorney Christiano Fagundes da Silva and the director Fábio Augusto de Souza occupy the first place, with a degree of Closeness 0, followed by the legislative assistant Bruno Gisler Dalmolin with a degree of 0.17, we understood that these countries are more subject to influence because they have a smaller average distance measure from the most central nodes. This classification is justified because the servers work in the Legal Attorney, General Directorate and Personnel Department sectors, which provides the obligation to establish

interpersonal relationships with all public servants of the City Council. However, it appears that these concentrate high credibility and trust of the other actors in the network.

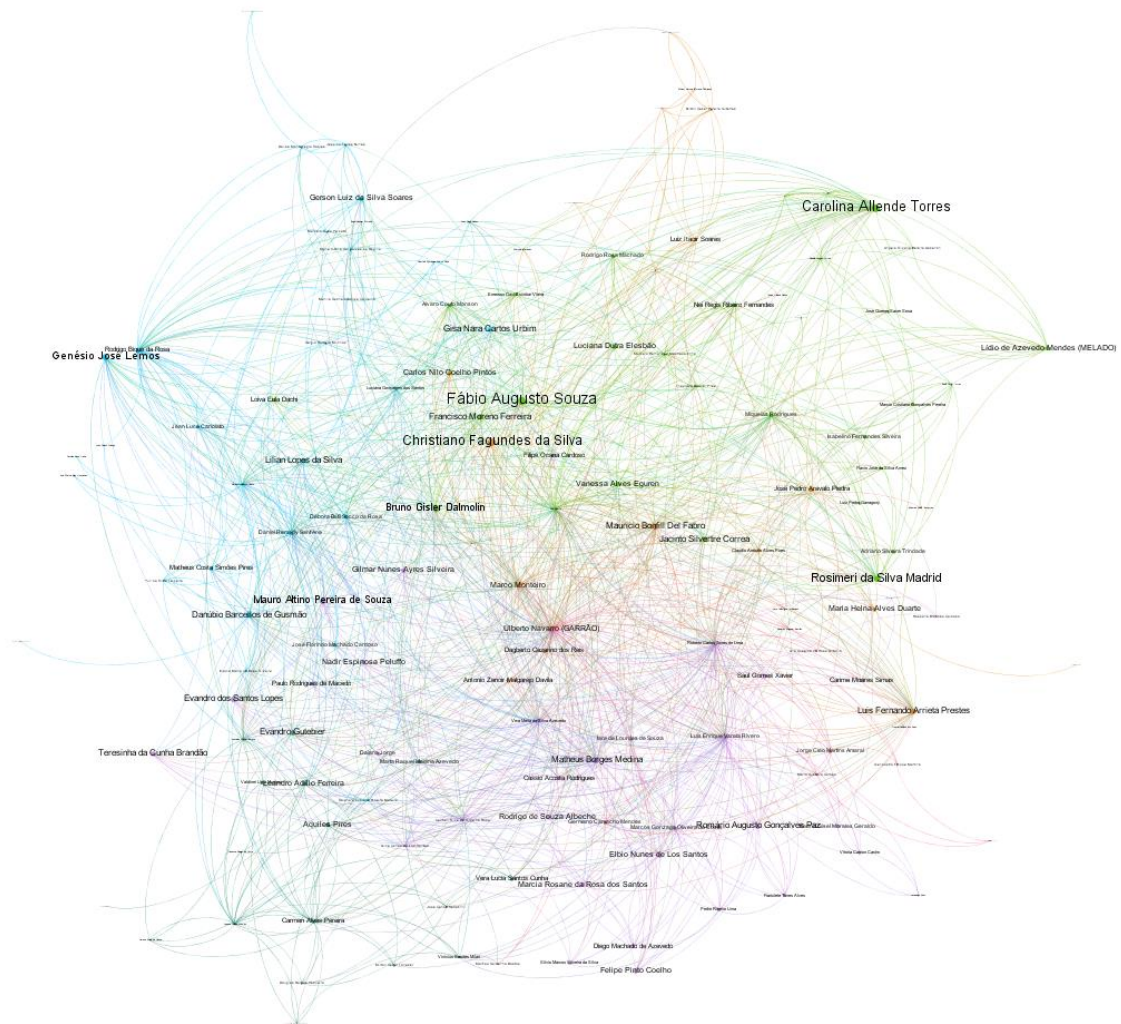
About the centrality of the eigenvector, we identified that the director Fábio Augusto Souza with degree 1 (cluster No. 5), followed by the legal attorney Christiano Fagundes da Silva with a degree of 0.68 (cluster No. 0), and the coordinator Carmen Alves Pereira cabinet with a degree of 0.64 (cluster No. 4), is the most prominent primary nodes of their respective clusters, that is, considering the direct and indirect connections, these public servants have an influence on the others in each group of public servants within the network (clusters), thus increasing its prestige and power of influence (Bonacich, 1972).

Regarding networks, when analyzed from the perspective of authority metrics, a new configuration can be seen, which shows practically the same actors in the three analyzed networks, unlike the result obtained in the previous analysis. This result is because the authority metric (Kleinberg, 1998) represents the sum of the hub with which each node has linked, that is, when a specific node transmits or broadcasts certain information to the receivers simultaneously.

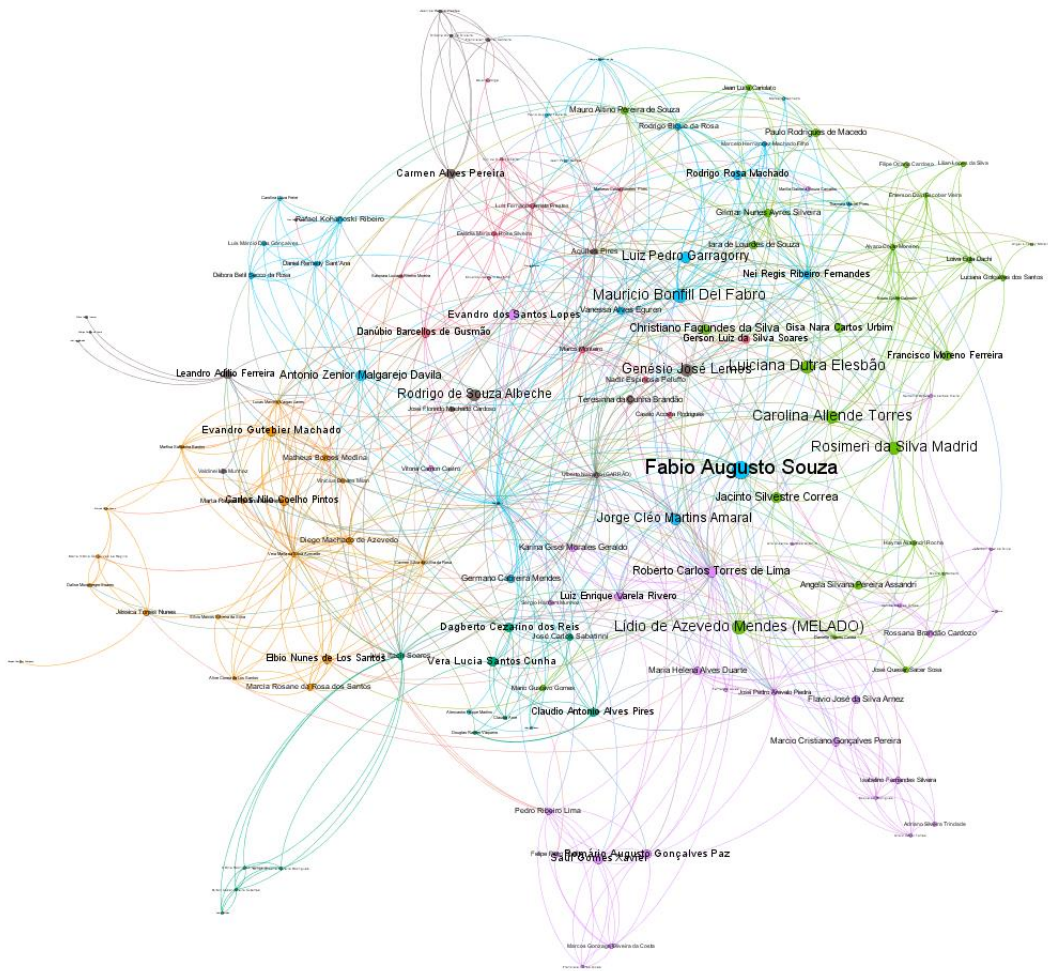
In this context, there is the differentiation of the power of the information flow that a node with a high degree of Betweenness has since it acts as a “bridge” or gatekeeper. That, in its position, decides which information should circulate between clusters or between a pair of actors. For example, in authority, the node transmits the same information without reservations or filters.

It can be seen visually, in Figure 4, that the most prominent nodes are permanent civil servants, in non-political positions, such as legislative assistants who work in different sectors such as the secretariat and human resources department, legal attorney, and directors.

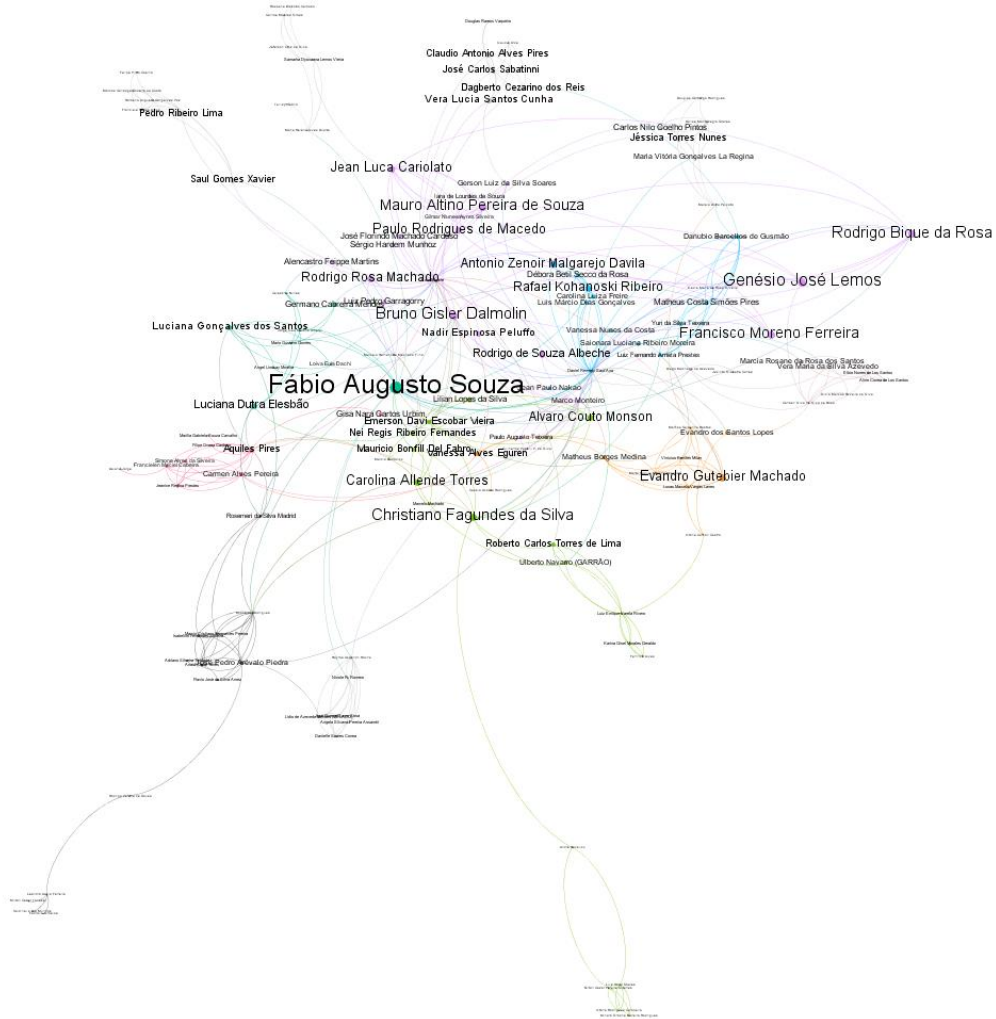
Figure 4 - The 15 most central nodes in the information exchange network (A), friendship (B) and trust (C) about authority metrics



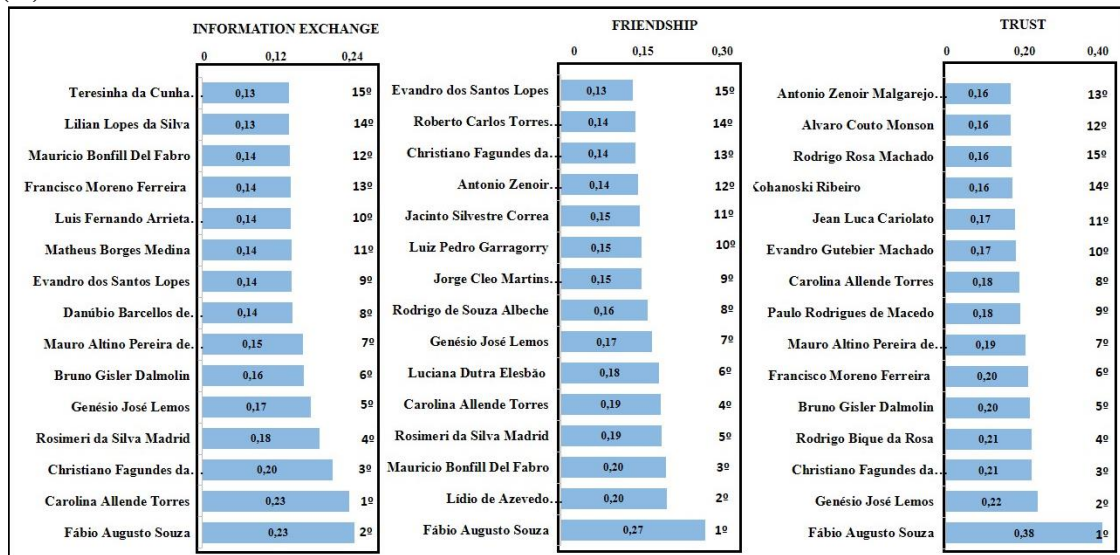
(A)



(B)



(C)



Source: Prepared by the author based on metrics calculated by the Gephi Software 0.9.1.

According to the results indicated, according to the authority metric. This public servant receives, transmits or disseminates the same information to the other actors (receivers) of the network at the same time in the interpersonal relationship of information exchange, friendship and trust are

the legislative official Carolina Allende Torres and director Fábio Augusto Souza, both tied for 1st and 2nd place with 0.23 degrees, and legal attorney Christiano Fagundes da Silva in 3rd place, with 0.20 degrees. We noted that the servers Carolina Allende and Christiano Fagundes did not respond to the social media measurement questionnaire since the first refused and the second was on vacation during the collection period, which highlights the importance of these actors in the network since they are integrating it because other actors have mentioned them.

CONSIDERATIONS

Thus, we learned from this analysis of social networks that the mathematical measures used (metrics) for the processing of information from the networks are of fundamental importance to highlight the formal and informal interpersonal relationships established within the City Council, as well as, from any other personal and professional environment, as it, elucidates them, as in the case of informal social networks for the exchange of information, friendship and trust in which the most prominent actors are heterogeneous, from different offices and sectors, and occupy different positions in commission, interns or staff, we noticed that these elements do not influence the establishment of a relationship between the actors.

However, when observing the authority network, a homogeneous configuration was noticed, which shows positions related to the general direction of the institution, secretariat and legal attorney. In the case of the analyzed actors, the legislative official Carolina Allende Torres and the Director Fábio Augusto Souza, it is understood that the role they play within the Legislative House requires strict compliance with specific rules and protocols inherent to their functions, which do not require given autonomy, but the fulfillment of specific, protocol, institutional and politically disinterested regulations. We believed that the factors mentioned above ensure that these actors have their information heard and considered by many networks.

We noted a board of directors formed by councilors and that the mayor at the time, councilor Maurício Bonfill Del Fabro, was the 12th most central node in the authority networks, which shows that the metric does not necessarily link to relations of hierarchy and power.

In this way, we expected to contribute theoretically to the academy, in particular to the Analysis of Social Networks, by demonstrating that, regardless of the position held by public servants of the City Council, whether they are effective, in commission or interns, the importance of each actor in the network it will be due to their involvement in the formal and informal networks.



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History of posters: Possible readings of the poster of the FIFA World Cup in Germany in 1974 and 2006

 <https://doi.org/10.56238/sevened2024.014-014>

Karen Cristina Kraemer Abreu¹ and José Antonio Meira da Rocha²

ABSTRACT

This research aims to record part of the history of the advertising poster production that circulates in more than 120 countries by observing aspects of the creation and graphic design of the communication product posters of the FIFA World Cup held in Germany, in the editions of 1974 and 2006. Analyzing poster productions helps us to understand society and contemporary communication. This research adopts the qualitative approach and the case study technique. For the analyses, references from the area of Advertising and Advertising such as Fonseca (1990), Moles (1974), Sant'Anna (1996), Cesar (2000) and, in the area of graphic design: Williams (2013), Donis (2002) and Chinen (2011) are used. It can be indicated as results, from the analysis carried out, that the posters, produced for the biggest event of a single sport, are results of different moments in the German country, the first in the second half of the twentieth century (1974) and the second in the beginning of the twenty-first century (2006). The poster is present in the current market, coexisting with other media, whether printed, electronic, digital and/or alternative.

Keywords: FIFA World Cup Posters, FIFA World Cup in Germany in 1974 and 2006, History of Posters, History of Advertising, Posters, Poster Production.

¹ Post-doctorate in Health Promotion, Human Development and Society (ULBRA). PhD and MSc in Language Sciences (UNISUL). Graduated in Advertising and Journalism (UNISINOS). Professor at the Department of Communication Sciences – DECOM, at the Federal University of Santa Maria – UFSM-FW. Member of the ConJor Research Group (UFOP). Member of the Research Group Communication and its Interfaces with Culture and Power in Organizations (UFSM). Member of the European Public Relations Education and Research Association - EUPRERA.

E-mail: karen.kraemer@ufsm.br

² PhD in Design (UFRGS) Master in Communication Sciences (UNISINOS). Graduated in Journalism (UFRGS). Professor at the Department of Communication Sciences – DECOM, at the Federal University of Santa Maria – UFSM-FW. Member of the research group International Communication and its Interfaces with Culture and Power in Organizations (UFSM). E-mail: joseantoniorocha@ufsm.br

INTRODUCTION³

The history of FIFA World Cup posters records the history of Western society. The History of Advertising helps to tell part of the history of world men's football and aspects of each host country that organizes the competition on its territory. The poster made to publicize the FIFA World Cup in the 1974 and 2006 editions of Germany are the objects of study of this investigation. In the German case, it seemed relevant to us to briefly recall the history, concepts and studies carried out at the German state school *Bauhaus*, carried out at the beginning of the twentieth century, which shaped the landmarks of *graphic design*, used until today. To build this trajectory, the works of Williams (2013), Dondis (2002) and other authors were used. It can be reported that the posters have very different creations from each other and that they present different times and situations between West Germany in 1974 and Reunified Germany in 2006.

The function of the advertising poster takes place in the urban space; its functional, aesthetic and cultural content is linked to the theory of signs. In the field of advertising, aesthetics is important in the expression of the message to be transmitted, it provokes the reaction of the target audience. It is what captures the attention and delights you. However, advertising does not have an aesthetic of its own, appropriating any formats to advertise its content. The creation of the posters has undergone modifications over time, reflecting social changes. The *Bauhaus* School is one of the main responsible for the aesthetic changes promoted in the design of printed communication products.

In the field of *graphic design*, the elementary concepts presented by Williams (2013) are developed in the advertising piece, namely: proximity, alignment, contrast and repetition. They are expressed in the German posters designed to present the FIFA World Cup in Germany in 1974 and 2006.

METHODOLOGICAL PROCEDURES

This research uses the qualitative approach and the case study technique. According to Rauen (2002), the researcher must develop three stages: exploratory, data collection and systematic interpretation of the data. The exploratory stage provided the opportunity to search for information about communication, advertising and *graphic design*.

The collection of information made it possible to find the significant and characteristic elements of the phenomenon studied and to relate them. And the analysis and interpretation of the data obtained on communication, advertising and *graphic design* and their aspects were important for the construction of the core text of this investigation.

³ Graphic design is the specific area of knowledge and professional practice related to the aesthetic-formal ordering of textual and non-textual elements that compose graphic pieces intended for reproduction with an expressly communicational purpose (N. dos As).

The search for information on Communication, Advertising and *Graphic Design* made it possible to construct observations about the Posters of the FIFA World Cup held in Germany in the 20th (1974) and 21st (2006) Centuries. On both occasions they are the return of the competition to European territory. In previous years, the FIFA Men's World Cup, with the exception of the 2002 World Cup, held in the East, FIFA built a roadmap by electing host countries located in Europe and the Americas. By 2006, the host country had been remodeled, having overcome the split between the two Germanys and the physical barrier of the Berlin Wall.

The objectives of this study are: 1) to record the History of Posters, as part of the History of Advertising, and 2) to analyze the creation of FIFA World Cup posters in the 1974 and 2006 editions, based in Germany.

CONTEXTUALIZING THE GERMAN POSTER PRODUCTION

Germany in 1919 was facing a period of difficult; the country was devastated at the end of the First World War and needed to comply with the requirements of the Treaty of Versailles, signed in Paris/FR. The Republic of *Weimar* It lasted from 1919 until 1933. At that time, important artistic movements emerged, such as expressionism, in cinema and in the plastic (visual) arts, and the state school itself *Bauhaus*.

The history of posters in Germany runs through the workshops of the *Staatliches Bauhaus*⁴, which was founded by architect *Walter Gropius* on April 1, 1919, in the city of *Weimar*, Central Germany. The *Bauhaus* arose from the reunion of two earlier schools, namely: the *Weimar Academy of Arts* and the School of Arts and Crafts. With a differentiated pedagogical proposal, he proposed a teaching based on the association between theory and practice, carried out in his workshops, and the approximation between art and crafts. Working with disciplines in the areas of fine arts, architecture and *design*, he influenced art and modern aesthetics (HULBURT, 2002).

The founder of the *Bauhaus*, *Walter Gropius*, was influenced by the European modernist avant-garde and wanted the School to be one of the references for the teaching and practice of modernist concepts. It proposed to train more socially responsible artists, *designers* and architects. It aimed at the progress of the country's cultural life and the improvement of society. *Gropius* disseminated his ideas through the manifesto that recorded the artistic program of the *Bauhaus*.

The *Bauhaus School* was a space for research, studies, applications of typographic techniques, development of new types of letters and alphabets, projects of utensils, furniture and buildings, posters for the dissemination of exhibitions, creation of magazine covers, architecture and graphic workshops. The German School was one of the most expressive and influential art institutions of the twentieth century.

⁴ The expression can be translated as Building House (N. da A.).

Innovative, the *Bauhaus* is part of the history of *graphic design*. During the period in which it was active, the School was a place where artists such as *Josef Albers*, *Hinnerk Scheper*, *Georg Muche*, *László Moholy-Nagy*, *Herbert Bayer*, *Joost Schmidt*, *Walter Gropius*, *Marcel Breuer*, *Wassily Kandinsky*, *Paul Klee*, *Lyonel Feininger*, *Oskar Schlemmer* and the female presences of *Gunta Stölzl* and *Marianne Brandt* were some of the teachers who experimented with new painting techniques, architecture, *design*, weaving and typography. Overcoming the limits of Modernism, he brought together avant-garde personalities from heterogeneous movements and put into practice the concepts defended by several modernist artists. The history of the *Bauhaus* is also the story of the birth of modern *design* and the tensions between art, craftsmanship, mechanistic technology, and functionalism.

The first sans-serif alphabet with rounded letters was a typographic product developed in the workshops of the *Bauhaus* in 1925, by *Herbert Bayer*. Posters produced to advertise exhibitions featured a composition of geometric figures, letters, and colors. Works were also developed to illustrate magazine covers. The production and studies developed at the School brought the foundations of the *design* modern graphic.

Fig.1: Universal alphabet, sans serif, called *Sturm Blond* by *Herbert Bayer*.



Source: <http://www.tipografos.net/bauhaus/alfabetos-elementares.html>

The Alphabet *Sturm Blond* Created by *Herbert Bayer*, In 1925, it was composed only of lowercase letters (lower case). The teacher's rationale *Bayer* He pointed to the saving of space in the typographic workshops, to the facilitation of reading for children in the literacy phase and because the spoken words do not distinguish between upper and lower case letters.

Another alphabet created in the workshops of the *Bauhaus* is the Universal Alphabet, developed by *Joos Schmidt*, the first student of the School of *Weimar*, who became a teacher at the *Bauhaus* and responsible for the typography area.

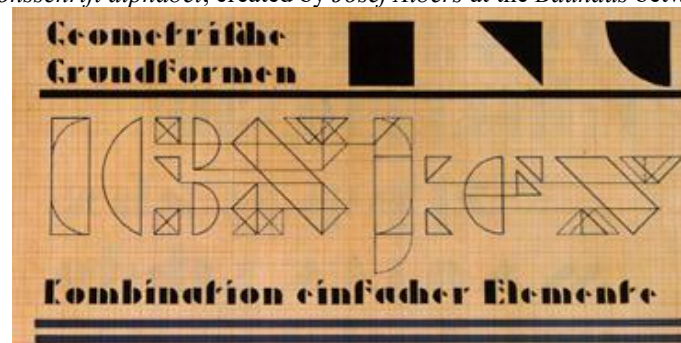
Fig. 2: Universal Alphabet, created by *Joos Schmidt* at the *Bauhaus School* in *Weimar*.



Source: <http://www.tipografos.net/bauhaus/alfabetos-elementares.html>

The third alphabet designed in the School's workshops *Bauhaus* It's the *Combination font* from *Josef Albers*, who was at the School from 1923 to 1926. Developed from geometric shapes and for stencil application.

Fig. 3: *Kombinationsschrift* alphabet, created by *Josef Albers* at the *Bauhaus* between 1923 and 1926.



Fonte: <http://www.tipografos.net/bauhaus/alfabetos-elementares.html>

Some Russian constructivists, who had participated in the *Vkhutemas*⁵, transferred to the *Bauhaus* in the first half of the 1920s, leaving Russia and taking their collective experiences and those of the Russian Constructivism movement with them. Among them was *Kandinsky*, who taught for a few years at the German school.

⁵ Higher School of Art and Technique - Russian state art and technology school founded in 1920 in Moscow, succeeding Svomas. The institution was established by decree of Vladimir Lenin for the purpose of "preparing artists with the highest qualifications for industry, builders and managers for technical-professional education." composed of 100 members and attended by 2500 students. Vkhutemas was formed through the merger of two existing schools: the Moscow School of Painting, Sculpture and Architecture and the Stroganov School of Applied Arts. The institution had the faculties of arts and industry: the faculty of arts taught courses in graphic arts, sculpture, and architecture, while the faculty of industry taught courses in printing, textiles, ceramics, woodworking, and metalworking (VARELLA, 2020).

[...] the teaching of the Bauhaus reflected a utopian vision of a community of artisans and artists who created simple and well-made objects. One of the main teachers was the mystic Johannes Itten, who taught a mandatory preparatory course (McGINITY, 2011, p. 414).

The *Bauhaus* offered courses in various creative workshops, with specific raw materials such as wood and steel, for example. Renowned artists at the time were active in the *Bauhaus projects*.

[...] The courses were taught by painters Wassily Kandinsky and Paul Klee, who had arrived at the school in 1921 to teach chromatic theory and analytical drawing. After Itten's course, students enrolled in workshops in locksmithing, weaving, theater, ceramics, wall painting, typography, or printing. Gropius's first hire for the Bauhaus was the painter and printmaker Lyonel Feininger, who taught in the printing workshop (McGINITY, 2011, p. 414).

Due to the Nazi persecutions, which considered the *Bauhaus School* and its productions as aberrations and propagation of degenerate artistic conceptions, the teachings and artistic productions of the *Bauhaus School* were transferred *from Weimar to Dessau*, the city in which the most recognized building of the *Bauhaus*, designed by *Gropius*, was erected. In the 1930s, the persecutions were amplified, and in 1933, with *Adolf Hitler's* rise to power, the artistic endeavors of the German state school were completely suspended.

Fig. 4: Bauhaus School building, designed by architect *Walter Gropius*, in 1925, *Dessau*, Germany.



Source: <https://www.todamateria.com.br/escola-de-bauhaus/>

THE LEGACY OF THE BAUHAUS SCHOOL

With the closure of the School in 1933, some teachers migrated to other countries, further spreading the ideas of the *Bauhaus* around the world. Many of them moved to the United States of America, including: *Gropius*, *Moholy-Nagy*, *Breuer*, *Bayer* and *Van der Rohe* for instance.

In 1937 the "New Bauhaus" appeared in Chicago/USA and, in 1945, the *Architectes's Collaborative (TAC)*, *Gropius' architectural office*, at the same time he was a professor at Harvard.

Max Bill, an alumnus of the *Bauhaus* School in Germany, founded the *Hochschule für Gestaltung* in the city of⁶*Ulm* in the 1950s.

To be *designer* it is necessary to have a restless mind and open to new possibilities; A different look and a unique lifestyle. In the area of Communication, it is necessary to be aware of market trends and project details; It is essential to pay attention to the ideas and concepts that will solve the complex problems brought by customers.

The influence of the concepts propagated by the *Bauhaus* School can be found in constructions, furniture, *graphic design* in various places around the world, until the present day, and it is possible to find imitations of products designed in the workshops of the *Bauhaus* School in Germany, being marketed without the proper licenses.

ADVERTISING POSTER ELEMENTS

Advertising posters did not emerge with the *Bauhaus* School movement, however, the modern concepts of creating *layouts* were developed in the workshops of that teaching-learning-experimentation space. Straight lines, simple letters, the use of lower case, complementary primary and secondary colors, images and geometric compositions, fusion of figures and other possibilities are teachings left by the groups of teachers and students of that German school.

In the development of graphic communication materials, the existence of the fundamental elements of the advertisement is visible⁷: 1) Title; 2) Text; 3) Image; 4) Signature; and, 5) *Slogans*, which make up the backdrop of the vast majority of ads. Some exceptions are foreseen, such as the use of *the teaser* (ad without identification of the advertiser – signature), the use of all-type ads (ad without the presence of an image, composed only of texts – title, text and signature) or *all-image ads* (ads without the presence of texts. Cesar (2000) advises that the "creative duo should never be static. [...] Never forget the smallest things." In the same sense, Vieira (2003) states that "[...] Finding the solution to the customer's communication problem is the most important thing."

PRINCIPLES OF GRAPHIC DESIGN

Williams (2013), in turn, presents four principles of *graphic design*, namely: 1) Contrast; 2) Repetition; 3) Alignment; and 4) Proximity. These principles guide the arrangement of graphics in the *layout*.

- 1) Contrast – You should avoid that the items in the *layout* are just similar. If the items are not the same, there must be a contrast between them: font, color, size, space, shape, line

⁶ The expression can be translated into Portuguese as Escola Superior da Forma (N. da A.).

⁷ In this work, the term "advertisement" is used in a broad way, encompassing all graphic, electronic and digital products developed by the creative duo of advertising agencies (N. da A.).

thickness, among other elements, must contrast with each other. To include contrast is to organize the information available to the reader.

- 2) Repetition – Use the various visual elements in the *layout*; repeat colors, textures, shapes, fonts, line thicknesses, spatial relationships, sizes, graphic concepts, etc. By using the principle of repetition, it helps to organize the gaze of the viewer/consumer of the communication product. Reading and understanding are made easier.
- 3) Alignment – Stipulating where to insert *the elements* of the layout brings a clean look to the *job*. Every graphic on the page should have some visual connection to another component of the *layout*.
- 4) Proximity – Every *layout* has several items: title, text, image, *slogan* and signature, for example. Some can be suppressed. However, the elements that are present and that communicate about the same aspect of the information must be arranged close together, creating spaces for the dissemination of information.

THE 1974 WORLD CUP VISITS WEST GERMANY

With more than one hundred and forty affiliated national football representatives, the International Federation (FIFA) reaps the best results of its activities so far. Ninety-four countries registered their national teams to compete for the remaining fourteen World Cup spots, plus the place of the host nation, West Germany, and Brazil, the champion of the previous tournament, in 1970, in Mexico.

The new election for the FIFA post was disputed by the president *Stanley Rous* and his Brazilian opponent João Havelange. Havelange was elected with the support of African, Arab and American countries, mainly, becoming the first non-European president of the entity.

For the 1974 event, some changes were presented; The quarterfinals and semifinals disappeared, giving way to two groups of four teams each. The teams ranked in the top positions of each bracket and the teams ranked second, vying for the third and fourth final positions. However, the World Cup continued to have sixteen teams, organized into four groups with four teams, which played against each other, qualifying for the second phase, the top two teams in each group.

The draw for the initial brackets of the dispute was made in January 1974, in *Frankfurt/AL*. The Brazilian team occupied one of the places in "Group 2", disputing the first two places with the teams of Scotland, Yugoslavia and Zaire. The strength of football in African countries was already greater that year.

More than twenty years after the end of World War II, West Germany became the venue for the FIFA World Cup in 1974. An old wish, prior to the war, is fulfilled in the new German territory, reconfigured and resized to a lesser extent.

At that time, most countries were affiliated to one of the two political-economic blocs led by the United States of America (USA) or the Union of Soviet Socialist Republics (USSR). The bipolar tensions between the capitalist and socialist blocs led to the construction of the Berlin Wall in 1961, dividing the city and symbolizing the antagonism between the two parties. The European continent had lost its hegemony and became the object of dispute between the two new great powers. A dichotomy between the capitalist West and the socialist East was also observed in the structuring of the cold war between the blocs led by the United States and the Soviet Union, respectively.

The conditions of the Cold War set the political tone for the event. Until that edition of the World Cup, there had not been such an intense security apparatus; "guard dogs, heavily armed police and gatherings that were strictly speaking, real prisons" were the main hallmarks of the tournament, according to Voser, Guimarães and Ribeiro (2010, p. 84). The criminal Palestinian attack, orchestrated by the Black September group against Israeli (Jewish) athletes at the 1972 Munich Olympics (*München*), contributed to the heavy and guarded atmosphere that was established at the 1974 German World Cup.

The media coverage of the games held in walled West Berlin showed the world the isolation of the countries of the "iron curtain", led by the USSR, pointing out their problems and difficulties in the eyes of the capitalist system, especially the emotional transmissions directed at the countries of Latin America, which largely suffered from right-wing military dictatorships, supported by the big brother of the United States.

In that event, the time of football-art was behind us; the big surprise of that tournament was the performance of the Dutch team, which moved tirelessly on the field, known as the "Clockwork Orange", alluding to the color of the uniform and its style of play called "Carousel" or "Dutch Carousel", where the ten athletes who play on the line move acting in any of the positions, creating unbelievable possibilities from vigorous physical training. It is European football-force giving the first brushstrokes of its performance. The Brazilian team was unsuccessful in that edition of the World Cup, qualifying only in fourth place. The winner was the home team, West Germany.

Occupying the top ten final positions of the 1974 championship, eighty percent of the teams are European. Representing South American football only the national teams of Brazil (4th place) and Argentina (8th place), totaling twenty percent of the vacancies. Of the eight teams from Europe, West Germany (No. 1), the Netherlands (No. 2), Poland (No. 3), Sweden (No. 5), East Germany (No. 6), Yugoslavia (No. 7), Scotland (No. 9) and Italy (No. 10). Two European nations from the socialist bloc feature in the top ten at the 1974 World Cup in West Germany.

THE POSTER CREATED IN 1974 IN WEST GERMANY

Designed by the German *Horst Schafer*, the poster developed to publicize the FIFA World Cup in West Germany in 1974 features a representation of a human figure, a soccer athlete, kicking the ball with physical strength and vigor, including the marking of the musculature in the painting of the soccer player through the ink arrangements. The representation of the "ball athlete" is composed of striking brushstrokes, vibrant colors on a black background, recalling artistic aspects of the Impressionist movement, important in Germany at the beginning of the twentieth century.

Schafer's *poster* is an example of contemporary art, recording the author's own time, the twentieth century, in Europe. The text at the bottom of the poster advertises the sporting event "FIFA World Cup 1974" in four languages: German, English, French and Spanish, occupying 2/3 of the width of the printed material. On the remaining 1/3 of the width of the poster, they state the date of the competition "13.6. – 7.7.1974", which took place from June 13 to July 7, 1974, and, in three columns and with three lines each, just below, the names of the nine host cities of the World Cup are informed.

The visual organization of the German poster created for the event demonstrates the knowledge about fundamental aspects of *graphic design* such as: 1) Contrast between figure and background, inserting the name of the sporting event and the information of date and places where the games take place, between the application of bright colors and black background, between the texture used in the painting of the representation of the athlete and the smooth aspect of the background.

2) Alignment between the arrangements of the texts with the information in four languages, in a left-aligned block of text, as well as in the presentation of the names of the nine German host cities arranged in three columns of the same visual width, and in three rows with the same spacing between them. There is also alignment between the painting of the human figure, which shows that it is in motion, a possible shot on goal, arranged in a balanced way, occupying about 50% of the central visual space of the poster.

3) There is proximity between the textual items. The name of the event recorded in four languages is arranged in four lines, one below the other. The arrangement of the nine cities in three columns contains the following information: *Hamburg, West-Berlin* and *Hannover*, in the first column, in the second column the names of the cities of *Düsseldorf, Gelsenkirchen* and *Dortmund*, and in the third column, *Frankfurt, Stuttgart* and *München*.

Regarding the use of the proximity principle, it is still possible to state that the layout items are close in: 1) Text – the block of text indicating the information with the name, date and place of the event is grouped; 2) Signature – included in the upper part of the poster on the left was the logo of the event; 3) Image – is the largest element of the poster, characterized by the representation of the

human figure through very marked brushstrokes; 4) Title – there is no title on the poster; and 5) *Slogan* – there is also no *slogan* or "catchphrase" applied to the West German poster developed for the football World Cup organized by FIFA in 1974. Although the sentences are composed in capital letters, the use of a sans-serif type refers to the teachings of the German *Bauhaus school*.

Fig. 5: Poster for the 1974 World Cup in West Germany.



Source: <https://www.mg.superesportes.com.br/app/noticias/especiais/copa-do-mundo-2014/historia/2014/03/30/interna-historia,283124/sem-o-encanto-de-70-e-batido-pela-soberba.shtml>

A UNIFIED GERMANY REINTRODUCES ITSELF TO THE WORLD AT THE 2006 WORLD CUP

In 2006, Germany (unified) once again hosted the World Cup, bringing the sporting event to Europe once again. The Brazilian team did not qualify for the final, a fact that harms the national media, which ended up focusing its work on various articles showing the "New Germany", which would be overcoming the horrors of World War II only at that moment, when it was conceiving itself unified again, a process that had begun in 1989, with the fall of the Berlin Wall. after twenty-eight (28) years of splitting.

The process of German reunification has its roots in the coming to Soviet power of the leader *Mikhail Gorbachev* in 1985, which began the process of political opening up of the USSR. The liberal process brought about by *Gorbachev* it affects and influences other republics of Eastern Europe, which made up the socialist bloc, and also the dissolution of the Union of Soviet Socialist Republics, which had Russia as the center of power. The fall of the "Iron Curtain" is an effect of the new Soviet policies and the end of the German Democratic Republic (GDR), East Germany.

With the fall of the Berlin Wall, the end of the physical barrier between the Germanies, comes the reunification of German territory. New problems arose; the different developments between the two parts of Germany were visible, yet the *Maastricht Treaty* made it possible for the countries from the "Iron Curtain" to join the European Union. The fall of the Berlin Wall is both a cause and a consequence of the end of socialism on the European continent. As a result, new right-wing leaders are now elected by popular vote in many European countries.

In the same way that one artistic style denies the former, in the 1990s and 2000s Eastern European countries denied Marxist ideas and the hypothetical distribution of wealth advocated by

them. Socialism and the left-wing parties that defended it were losing the elections, and the satellite countries of the former USSR cut the "umbilical cord" that kept them tied to Moscow.

The market economy was shown to be the condition for restructuring Europe socio-politically and economically. The European Union began to help the new countries to rebuild their economies and implement political reforms, contributing to the European market becoming a real single market, with a strong and unified currency, enabling the free movement of goods, services and people in that territory, eliminating the old obstacles to the European project, as of June 1993, with the signing of the Copenhagen Declaration.

The European Union believed that, due to the emergence of new market powers, such as China, for example, the only solution to ensure economic growth would be the establishment of an economic bloc that would guarantee them free trade: expanding the variety of consumer goods, limiting prices by competition, creating consumer protection policies. They still believed that they needed a single, unison political demonstration.

According to Denardin (2011, p. 113), "despite the beautiful structure they had with stadiums, airports, train lines, hotels and everything that a World Cup requires, [...] They also invested a lot of money to deliver a perfect World Cup to the nations. Seven of the twelve stadiums where the games took place had been used [in] 74." Among them, the Olympic Stadium in Berlin, built by *Hitler* for the 1936 Olympics, also hosted by Germany, before the post-war split.

In that year of 2006, the German population believed in winning the World Cup on German territory; They were coming from a runner-up in the World Cup, in 2002, and already held the title of three-time champions, they had the tactical discipline, the physical strength and the motivation to play the games in their own country, with the support of the fans who were excited about the games of the German team.

The international press also believed that the German team would be the big surprise of that World Cup and followed the actions of that sports team on a daily basis. The Brazilian group, which arrived at the World Cup as the winner of the 2002 World Cup, also had its concentration observed and commented on by the various media outlets that covered the sporting event.

The teams of Italy and France did not stand out in the eyes of the media, however, as stated by Voser, Guimarães and Ribeiro (2010, p. 134), those selected "ran on the outside, [...] the Italians prepared to win the World Cup and not to put on a show, in the middle of the competition they concentrated on their own style of play, defending."

The final match was played between the teams of Italy and France, who drew 1-1 (1-1) in regular time. With extra time and, finally, with a penalty shootout, the Italian team can celebrate winning the title, with a result of five to three, over the 1998 champions. It was the second World Cup final in which a penalty shootout decided the champion.

The top ten places in the official FIFA *rankings* of the 2006 World Cup in Germany followed the level of the previous championships: Italy (1st place), France (2nd place), Germany (3rd place), Portugal (4th place), Brazil (5th place), Argentina (6th place), England (7th place), Ukraine (8th place), Spain (9th place) and Switzerland (10th place).

Only Brazil (5th place) and Argentina (6th place) are teams from non-European countries, representing twenty percent of the top ten positions. Europe sent thirteen national teams accounting for forty percent (40%) of the berths, the Americas, nine (four from South America, three from Central America, and two from North America), Africa, five, Asia, two, the Middle East, two, and Oceania, one; it was the first World Cup in which the Australian team (16th placed) participated.

THE POSTER DEVELOPED FOR THE NEW GERMANY CUP

In the 2006 edition in Germany, the poster to publicize the FIFA World Cup was conceived from the Agency's project *WE DO Communication*, which brought the stars as a reference to desires and dreams, drawing a soccer ball as a bright constellation (figure), on the blue infinity (background). The stars form the pentagonal and hexagonal buds of the figure of the soccer ball, the sporting instrument played in each match of the competition organized by FIFA. The choice of the poster was made by the former player of the German national team, *Franz Beckenbauer*; the greatest idol of German men's football (SOUZA, undated).

Stars refer to outstanding athletes: "football stars", to movie celebrities: "stars of *Hollywood*"; to the handprints and feet of personalities on the "Walks of Fame" in various parts of the world. In short, to be a star in a certain sport or sector is to have your talent recognized. To bring the figure of the ball formed by numerous stars, building a constellation in the shape of a soccer ball is to indicate that the athletes who participate in the competition, the members of the national teams are "stars", they are outstanding players in the profession, it is also to indicate that the national teams themselves, which won the places to participate in the FIFA World Cup in 2006, They are quality references in the world of football.

The figure of the ball made up of the stars occupies about 60% of the visual space of the poster, even though it is large, it is not an element with exacerbated visual weight because it is a hollow figure, like an astronomical constellation. The unified Germany brings in its poster of the 2006 FIFA World Cup the constellation of football, indicating the importance of the event for planet Earth, from where one can see and admire the sky where the ball figure composed of numerous stars can supposedly be visualized by the humans of the more than 120 countries that receive the

television broadcasts of the games played in the period also informed on the poster. June 9 to July 9, 2006⁸.

Just below the image of the "constellation of the soccer ball", there is the logo of the event where it is possible to read: "FIFA World Cup", in the first line, and "Germany" in the second line, completed by the information of the year "2006", in the third line. Next to these three lines of text, written in English, is the image of the event's logo: "three smiley faces" in yellow, blue and green, arranged in the shape of an isosceles triangle, with the vertex pointing upwards, accompanied, below, by another circle with the graphic representation of the event's trophy. On the left side of the blue face, there is a red semicircle, creating a projection of shadow and depth, increasing the highlight of the image in relation to the background, also in blue, and to the words (FARINA, PEREZ and BASTOS, 2011). Below, the same information is displayed on the German poster: "2006 FIFA World Cup Germany TM"; the line below reads: "June 9 July 9", indicating the period of the FIFA event.

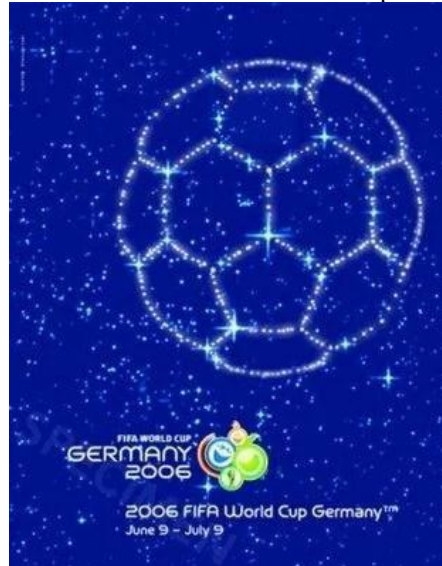
The reunified Germany of 2006 welcomes the delegations of the football teams qualified for the sports tournament with an eye on the universe and the constellation of the ball. A ball that is made up of several segments, as well as the national teams made up of different football players, as well as the various national teams, different from each other, arriving from various continents. The reunification of Germany after 28 years of division is also different. Different peoples between West and East German populations, with different habits, genders, ages, customs and cultures are also diverse among peoples.

The FIFA World Cup in Germany, in 2006, went down in the history of the championship as the one that presented the largest organization and the best conditions for journalists and media outlets to work in sports coverage.

The organization also facilitated the daily life of fans both in accessing the stadiums and in the use of public transport, food places and circulation in the cities and between the host cities of the event. All the informed schedules were practiced, all the itineraries matched the local reality. Both fans and some members of the international press praised the German organizing committee.

⁸ On the German poster of the 2006 FIFA World Cup in Germany, the information about the date of the event is displayed as: "June 9 – July 9".

Fig. 6: Poster for the 2006 FIFA World Cup in Germany.



Source: <https://www.quadrodemedalhas.com/futebol/copa-do-mundo/copa-mundo-2006-mundial-alemanha.htm> .

CONSIDERATIONS

The history of humanity, the use of technology and aesthetics compose and influence the production of Western posters of each era. The elaboration of the German posters for the promotion of the FIFA World Cup, both in 1974 and 2006, evokes the principles elaborated by the *Bauhaus* School, facilitating reading, developing well-elaborated images full of meanings important to the socio-historical moment of the host country. Textual and visual languages are present in the creations of German posters in both editions. The main use of the image in the German posters of 1974 and 2006 is present in the posters designed to announce the sporting event to the 120 countries that follow the football matches in the FIFA World Cup, held in Germany in 1974 and in 2006 by media broadcast.


Advertising finds inspiration in artistic movements in styles and approaches that enchant and sweeten the eyes of the different audiences that are exposed to the messages. At each time, ways of disseminating the information of the companies contracting the advertising campaigns are chosen. The poster production follows the changes in Western society and has maintained its space with the public, especially at the Points of Sale - POS, where they can deliver the message of the Product, Brand, Service and Event - PMS+E, to the consumer.

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Literacy as a contribution to socioeconomic inclusion: The case of a youth group from Namibe, Angola

 <https://doi.org/10.56238/sevened2024.014-015>

Teresa de Jesus Portelinha Almeida Patatas¹

ABSTRACT

Educated youth is vitally important for the future of Angola. Youth illiteracy is one of the obstacles to greater socio-economic inclusion. The country is committed to intensifying literacy with the aim of eradicating this complex obstacle with multiple causes (historical, economic, social, cultural, political, etc.). This study aims to show how literacy is transforming the socio-economic inclusion perspectives of a group of young people in the province of Namibe. A bibliographic and documentary research was carried out. This was a case study of a youth group from Namibe, Angola. In the empirical phase, focus groups were applied in November 2021 to 22 young people (13-18 years old) in a class of beginners in literacy, in Moçâmedes (host municipality). The results showed that it is the desire for "functional literacy" for the acquisition of knowledge considered necessary to be able to function socioeconomically in this context. These young people, previously excluded from the school system, felt socially discriminated against, victims of prejudice and some verbal aggression. They decided to start studies to change this reality. Despite the poor infrastructural conditions, schools are motivated and "happier". They believe that this learning will increase their socio-economic inclusion in that specific context.

Keywords: Youth illiteracy, Literacy, Socioeconomic inclusion, Angola.

¹ Academic degree: Doctor in Educational Sciences and post-doctorate in Comparative Education.

Academic institution: University of Namibe, Angola.

Affiliation: Centre for Interdisciplinary Studies in Education and Development (CeIED), Lusófona University, Portugal.

E-mail: teresapatatas.angola@gmail.com

INTRODUCTION

Education is of paramount importance for the sustainable development of countries. The United Nations 2030 Agenda (signed in 2015) sets a deadline of 2030 for the achievement of Sustainable Development Goal 4 (SDG-4): quality education, "leading to relevant and effective learning outcomes",² adds the guarantee that by that year a substantial proportion of adults will be literate.

According to Silvestre (2003), education makes man and the world evolve, however, the task of educating is difficult. The difficulty lies in the complexity of the process, which involves multiple conditioning factors, namely socio-economic, cultural, or even political ones.

Angola is a post-conflict and developing African country. The country has a young population, according to the 2014 Census (INE, 2016), 65% is aged between 0 and 24 years (47.2% aged 0-14 years and 50.3% is between 15-64 years). Educated youth is vitally important for the future of Angola. Also according to the Census, only 77% of the population between 15-24 years old knows how to read and write (84% men and 70% women), 25% have not completed primary education (INE, 2016). Youth illiteracy is one of the obstacles to greater socio-economic inclusion of young people in this country.

This study aims to show how literacy is transforming the socio-economic inclusion perspectives of a group of young people in the province of Namibe, a province located on the southern coast of the country.

In order to achieve this goal, a bibliographic and documentary research was carried out. This is a case study. This research has a qualitative focus. In the empirical phase, focus groups were applied in November 2021 to a group of young literacy starters in precarious school facilities in a poor neighbourhood. The study focuses only on Moçâmedes, chosen among the other municipalities of the province of Namibe because it is the main municipality and consequently the most populous (according to the 2014 Census, about 60% of the Namibian population lives there).

ILLITERACY AND LITERACY

Illiteracy in Angola has historical causes, as due to colonial educational policies the common people had little access to education. After independence, as expected, the national situation was difficult in all areas, with great delay in terms of economic, social and educational development.

In the field of education, among other negative consequences, Angola inherited from the colonial regime Portuguese a literal illiteracy rate estimated at 85% of the economically active population (Strategic Plan for the Revitalization of Literacy - PEPRA, 2012). The literacy campaign

²<https://unric.org/pt/objetivo-4-educacao-de-qualidade-2/>



in Angola began in 1976. However, a post-independence civil war made it difficult to achieve the goals of this campaign.

The country has been at peace since 2002, however the war has left scars that still hinder the desired success of literacy. In 2005, the Ministry of Education of Angola recognized the existence of educational delays, and at the time, sub-Saharan Africa was "one of the countries with the highest rates of literal illiteracy and underschooling, a fact that conditions the process of economic and development recovery and stabilization" (p. 4). In 2019, one in four Angolans could neither read nor write.

According to Presidential Decree No. 257/19 of August 12 (2019):

Illiteracy in Angola is not just a residual problem inherited from the past (susceptible to emergency treatment or capable of being overcome through simple generational succession). This is a current and complex problem, which requires the implementation of consistent, lasting public policies that are linked to other economic, social and cultural development strategies (p. 5041).

Literacy in Angola is based on this Presidential Decree (No. 257/19 of August 12) aligned with the PDN – 2018 – 2022, which at the base had three projects, namely: eradication of illiteracy in Angola; reduction of school delay in Primary and Secondary Education; and vocational training and vocational guidance. The results of these projects are not yet known.

In addition to the historical causes, there are also others that complicate the phenomenon of national illiteracy, such as economic, social, cultural and political causes, etc. For example, in 2020, 4 million citizens missed literacy classes due to the COVID-19 pandemic. Regarding policies, it can be noted that "despite the national effort, the allocation of budget resources for the education sector, the fight against illiteracy and youth and adult literacy is still less than half of what is internationally recommended in this area" (Freitas, 2014, n.p.).

The Angolan state is committed to intensifying literacy with the aim of eradicating illiteracy. Literacy becomes a national imperative. For Soares (2003), the restricted term of literacy, as teaching to read and write, is being rethought, because lately a broader meaning has been given to literacy as a permanent process for life, going beyond learning to read and write. In the same sense, Freitas (2014, p. 5) states that currently "literacy is understood not as a single concept, but as a plural concept, since it has become evident that it serves multiple purposes and is acquired in different ways".

In the educational context, the Angolan government considers literacy "a preponderant factor for the sustainable development of the country" (Presidential Decree No. 257/19, of August 12, p. 5040). For the Angolan State, "there seems to be a consensus that education, even at its minimum level of literacy, is a fundamental and indispensable condition for the full dignity of citizens and for the human and sustainable development of the country." (Ministry of Education, 2005, p. 4).

It is pertinent to clarify that, according to Law No. 32/20 of August 12 (2020), literacy is part of Adult Primary Education and corresponds to the 1st and 2nd Grades, from the age of 15 and Post-literacy, corresponds to the 3rd to 6th Grades and is attended from the age of 17 (Article 55).

The Action Plan for the Intensification of Literacy, Youth and Adult Education - EJA-Angola Plan 2019-2022 emerged for the implementation of the Executive's policies for economic and social development, in which the fight against illiteracy is one of the main pillars.

In 2017 the Literacy Rate for Youth and Adults over 14 years of age was 75.3% and had a target for 2022 to be 82.8%, in which case the illiteracy rate would drop to 17.2%. The results of the EJA Plan are awaited in order to analyze its effectiveness.

EMPIRICAL RESULTS

According to Gondim (2003, p. 145), "in the last two decades there has been a significant growth in the use of focus groups in research in various scientific disciplines". In the empirical part of this case study of a youth group from Namibe, this path was followed and focus groups were carried out in November 2021 with 22 young people (14 boys and 8 girls), between 13 and 18 years old, constituting a group of beginners in literacy in facilities with precarious structures in a poor neighborhood, in Moçâmedes.

Morgan (1997, cited by Gondim, 2003, p. 151) defines focus groups as "a research technique that collects data through group interactions when discussing a special topic suggested by the researcher. As a technique, it occupies an intermediate position between participant observation and in-depth interviews." It can also be characterized as a resource for understanding the process of construction of perceptions, attitudes and social representations of human groups (Veiga & Gondim, 2001, cited by Gondim, 2003, p. 151). This qualitative data collection technique was used to better understand the perceptions of the reality of literacy from the perspective of these young people.

The results showed that it is the desire for "functional literacy", since the main target is the acquisition of knowledge considered by the group itself as necessary to be able to function socially in this specific context.

These young people, excluded from the school system, have never attended school. They said they felt socially discriminated against, as well as victims of prejudice and even verbal aggression, among other negative attitudes due to the fact that they were illiterate. They decided to start their studies that year to change this sad reality. Despite the poor school infrastructure conditions, they are motivated to learn and feel "happier" with what they have already achieved.

Young people say that this learning will bring them: an increase in personal autonomy; increased socio-economic participation; a means for insertion into the world of work; better salary to increase the low economic conditions of the family and also to obtain bases for high school



(minimum condition for some jobs). They believe that they will be able to acquire social practices considered crucial for the group, such as: knowing how to make change well; not to be financially cheated; read important documents (especially news, subtitles of films and documentaries, SMS, prescriptions, prescriptions and medical indications, among many others); know how to sign and also know what you are signing; helping younger siblings with schoolwork; and so on.

By referring to the expected benefits, they showed conviction in this possibility and hope for a more promising future after the literacy process, which, they say, they have already seen "to be a little difficult, but not impossible".

CONCLUDING NOTE

The Angolan State considers the fight against illiteracy as a major pillar for the country's economic and social development. This study aimed to show how literacy is transforming the socio-economic inclusion perspectives of a group of young people in the province of Namibe.

The empirical results showed that it is a question of the desire for a "functional literacy" for young people, that is, to have knowledge considered by them as necessary to be able to function socially in this local context, in this municipality in particular, in the province of Namibe and in a post-conflict developing country. We have seen here, in this case, (youth) literacy considered as an important contribution to greater socio-economic inclusion in Angola.


The results of this case study of a youth group from Namibe, although simple, can contribute to a reflection on some points of this theme.



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Evaluation of the hematological profile of pregnant and non-pregnant mares seen at the HVU-BJ/CPCE in Bom Jesus-PI

 <https://doi.org/10.56238/sevned2024.014-016>

Gustavo Nogueira Silva¹, Davi Soares Serra Cardoso², Leopoldo Fabrício Marçal Nascimento³,
Fernanda Vieira Henrique⁴, Kenney de Paiva Porfírio⁵, Débora Costa Viegas de Lima⁶, Wagner Costa
Lima⁷ and Manoel Lopes da Silva Filho⁸

ABSTRACT

The blood count is a widely used test in equine medical clinics, being of great importance in the institution of an efficient diagnosis. During pregnancy, physiological adaptations occur such as increased blood volume, uterine expansion, proteins and other nutrients are higher due to fetal development and formation of maternal structure such as placenta, mammary glands and blood. Therefore, it is essential to know the alterations in the hematological constituents in pregnant mares. The objective of this study was to characterize the hematological profile and evaluate possible hematological alterations between pregnant mares and non-pregnant mares. The research was carried out from March 2019 to June 2019, where blood samples were collected from 20 clinically healthy mares that were referred for pregnancy diagnostic examination, these were attended at the large animal outpatient clinic of HVU-BJ/UFPI, at Haras do Hélio Rosa and Haras do Bispo, the last two being private properties, all of them are located in the municipality of Bom Jesus/PI. Of the alterations found, anemia found in high prevalence, leukocytosis, eosinophilia found in low prevalence in both groups, and lymphopenia found in an animal in the non-pregnant group stand out. Therefore, mares that were in the gestation period between 60 and 90 days presented a picture of normocytic normochromic anemia, justified by blood hemodilution, characterizing the stage of gestation that requires more attention.

Keywords: Hematology, Horses, Pregnancy.

¹ Graduate in Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelin Elvas Campus

E-mail: gusttavo.veterinario@gmail.com

² Undergraduate student of Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail: davicardosovet@ufpi.edu.br

³ Adjunct Professor, Department of Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail: leopoldomarc@ufpi.edu.br

⁴ Doctor in Animal Science and Health

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail: dra.fernandahenrique@ufpi.edu.br

⁵ Adjunct Professor, Department of Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail: kenneymv@hotmail.com

⁶ Adjunct Professor, Department of Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail: debora.lima@ufpi.edu.br

⁷ Adjunct Professor, Department of Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail: wagnercl@ufpi.edu.br

⁸ Associate Professor, Department of Veterinary Medicine

Institution: Federal University of Piauí, Professor Cinobelina Elvas Campus

E-mail Author for Correspondence: manoellopes@ufpi.edu.br

INTRODUCTION

The world equine population has been stable in recent decades and is currently estimated at 113,473,522 head, of which 58,770,171 are horses, 43,496,677 are donkeys and 11,206,674 are mules, as shown in table 1 (FAO, 2008). The world equine population is distributed across the continents as follows: Africa, with 4,519,216 head. (7,7%); America, with 33,594,119 cab. (57,2%); Asia, with 13,870,140 cab. (23,6%); Europe, with 6,374,740 cab. (10,8%); and Oceania, with 411,956 cab. (0.7%), and the concentration of equine production and use in the Americas is evident (FAO, 2008).

Table 1 - World population of horses, donkeys and mules (heads)

Continent	Equine	Asininos	Muare	Total (Equideos)
Africa	4.519.216	18.559.137	1.060.913	24.139.266
America	33.594.119	7.161.527	6.318.150	47.073.079
Asia	13.870.140	17.129.456	3.604.713	34.604.309
Europa	6.374.740	637.557	222.898	7.235.195
Oceania	411.956	9.000	-	420.956
Total	58.770.171	43.496.677	11.206.674	113.473.522

FAO (2008)

The worldwide distribution of horses and also of donkeys and mules between continents or countries reflects productive, sanitary, legal and cultural aspects. However, it should be noted in the last decade the reduction of the equine population in Asia, mainly in China, from 8,916,154 head in 2000 to 6,823,465 head in 2008 (FAO, 2008), associated with the internal migration of the human population. with less use of equidae in transport and agriculture and higher consumption of equine meat. On the other hand, in the United States there was a significant increase in the equine population, from 5,240,000 head in 2000 to 9,500,000 head in 2008 (FAO, 2008), partly due to internal legal restrictions on the slaughter and export of equine meat.

In Brazil, the equine population is currently estimated at 7,986,023 head, of which 5,541,702 are horses, 1,130,795 donkeys and 1,313,526 mules. The national equine population is the fourth largest in the world, with about 5,600,000 animals, which has remained stable in the last decade (IBGE, 2008). In South America, in addition to Brazil, equine production is highlighted in Argentina, with an estimated herd of 3,680,000 animals, and in Colombia, with 2,520,000 animals.

The equine agribusiness complex in Brazil has a turnover of about R\$ 7.5 billion and generates about 3.2 million direct and indirect jobs. The equine, in the economic aspect, performs the functions of saddle, load and traction. From the second half of the twentieth century onwards, sports and leisure activities stand out in the social aspect, as well as hippotherapy for the treatment of people with cognitive, psychomotor and socio-affective difficulties (LIMA *et al.*, 2006, VIEIRA, *et.al.*, 2015). Also noteworthy in equine agribusiness are the various suppliers of inputs, products and services for breeding, such as medicines, feed, saddles and accessories, shoeing, veterinarians and



trainers, equine transport and teaching and research. In the agricultural complex, the equine segment used in various sports activities moves values of around R\$ 705 million and employs about 20,500 people, with the estimated participation of 50 thousand athletes (LIMA *et al.*, 2006).

In the area of research, science and technology, according to Lima et al. (2006), in 2004 there were about 34 research groups registered with CNPq, with the participation of 666 researchers. Currently, about 60 research groups are registered with CNPq. Of these groups, 48 are related to research in Veterinary Medicine, including horses, 10 groups are related to Animal Science, including horses, 1 group in Biochemistry and 1 in Microbiology, with studies in horses.

In Brazil, as in other countries, investments in equine research are related to the perspectives of the equine industry segments in the country. Research can be broken down as being in production and management, genetics and breeding, nutrition and feeding, reproduction, medicine and surgery, diseases, health and health defense. There is also research in areas related to equestrianism, involving sports physiology, horsemanship and equine training. Finally, there are also studies on the national and international production and commercialization of horses, equine meat and by-products (LIMA *et al.*, 2006).

The blood count is one of the most requested tests of the clinical routine because it serves as a "mirror" of the animal's health at the time of collection. It is routinely used to clinically monitor the development and performance of animals, since this examination enables both the investigation of pathological alterations and the monitoring of health, through a diversity of information provided through the analysis of the constituents of blood tissue (MORY, *et al.*, 2004). Therefore, the vascular system is indispensable for the maintenance and performance of all systems of the body, including the reproductive tract. Because it fulfills the metabolic need and assists in the regulatory transport of substances, this system is directly related not only to the hormonal supply, but also to the physiological variations of the reproductive tract (DUKES and REECE, 2006, AKAHIRO, 2011).

During pregnancy, physiological adaptations occur, such as increased blood volume, uterine expansion, increased need for energy, proteins, and other nutrients due to fetal development, and formation of maternal structure such as placenta, mammary glands, and blood (GRAVENA *et al.*, 2010, FRADINHO *et al.*, 2014). Reproductive efficiency is closely related to body condition, which has an effect on the duration of seasonal anestrus, the transition period to cyclic activity, the interovulatory period, IGF-1 eleptin secretion, the number of cycles/conception and the rates of pregnancy, early embryonic loss and abortion (BENDER, *et al.*, 2014). Thus, the knowledge of the alterations in the hematological constituents in pregnant mares is indispensable, since they will contribute decisively to the clinical veterinarians who provide services to this species. Considering the importance of the blood count as a routine test in the evaluation of the health status and in the monitoring of the diseases of the animals, associated with the modernization of hematological

techniques through the use of automated equipment, we sought to characterize the hematological profile and evaluate possible hematological alterations between pregnant mares and non-pregnant mares from the casuistry of the University Veterinary Hospital and the farms contracted with the *Campus* University Teacher Cinobelina Elvas-CPCE.

MATERIAL AND METHODS

The samples were collected at the outpatient clinic of the University Veterinary Hospital of UFPI/CPCE, at Haras Helio Rosa and Haras Bispo, both properties located in the municipality of Bom Jesus-PI. The samples were processed at the Clinical Pathology Laboratory of the HVU, at the Federal University of Piauí, Professor Cinobelina Elvas Campus. Blood samples were collected from 20 healthy mares (evidenced by physical examination and blood count) with a mean age of 10 (± 5.0) years and a mean weight of 402.5 (± 50.1) kg, separated into two groups: control group (non-pregnant) and group 01 (pregnant women).

The animals were submitted to the same nutritional management and climatic conditions. In pregnant mares, rectal palpation and ultrasound examinations were performed to confirm gestational conditions. Samples were collected by venipuncture of the jugular vein. After being collected, the material was sent to the veterinary clinical pathology laboratory of the veterinary hospital (HVU-CPCE), where in an interval of 24 hours the blood count was completed, which was aimed at the global count of the number of red blood cells, determination of globular volume, hemoglobin content, absolute hematimetric indices such as Mean Corpuscular Volume (MCV) and Mean Corpuscular Hemoglobin Concentration (MCHC). overall and differential leukocyte count, platelet count, and determination of total plasma protein concentration. The total number of red blood cells was counted in a Neubauer chamber. For this purpose, the cells were diluted in a proportion of 1:200, using a semi-automatic pipette of 20 microliters. To determine the globular volume, the microhematocrit technique was used, in which homogeneous capillary tubes of 75 millimeters in length and 1 millimeter in diameter were used. On the other hand, the determination of the hemoglobin content in the blood was made by the cyanomethaemoglobin method with previous dilution in Drabkin's solution.

The total number of leukocytes was counted in a Neubauer chamber, and the blood samples were diluted in a ratio of 1:20, using Turk's fluid as diluting solution. Fresh blood smears were produced for leukocyte counts. In each blood smear, 100 leukocytes were differentiated, classified and read under a microscope at 1000x magnification, according to their morphological and dyeing characteristics, into neutrophils, eosinophils, basophils, lymphocytes and monocytes. The determination of Total Plasma Proteins (TPP) was performed by refractometry, after centrifugation at 12,000 rpm/min of the blood in a microhematocrit capillary. The data obtained were submitted to

statistical analysis using the analysis of variance method (ANOVA). Differences were considered statistically significant when $P < 0.05$.

RESULTS AND DISCUSSION

Regarding the erythrocyte profile, the variables analyzed were not significantly influenced ($P < 0.05$) by the pregnant group compared to the non-pregnant group, as shown in Table 1.

Table 1 – Mean values \pm standard deviations of erythrogram of pregnant and non-pregnant mares.

Erythrogram	Pregnant	Non-pregnant	Reference values*
Hematias ($\times 10^6/\text{ul}$)	6.32 ± 0.87	7.02 ± 1.04	6.8 -12.9 ($\times 10^6/\text{ul}$)
Hemoglobina (g/dL)	10.5 ± 1.16	11.65 ± 1.51	11-19 (g/dL)
Hematocrit (%)	30.3 ± 3.59	34.1 ± 4.93	32-53 (%)
MCV ¹ (fL)	48.19 ± 3.86	48.67 ± 3.58	37-59 (fL)
CHCM ² (%)	34.27 ± 1.192	34.12 ± 1.47	31-39 (%)

*WEISS & WARDROP (2010). 1 Mean globular volume. 2 Mean Globular Hemoglobin Concentration.

The values found in the red blood cell count ($6.352 \times 10^6/\text{ul}$), hemoglobin (10.5g/dL), and hematocrit (30.3%) of the group of pregnant mares presented values below the standard values for the species, according to Weiss & Wardrop (2010). In the opinion of Souza et al. (2002), the values are decreased due to the greater expansion of the plasma volume in relation to the expansion of the erythrocyte mass during pregnancy, resulting in a decrease in hemoglobin and hematocrit concentrations, decreasing blood viscosity.

The reference values for the non-pregnant group did not change and remained within the reference values for the species (WEISS & WARDROP, 2010).

The values of MCHC and MCV did not show significant difference ($P < 0.05$) during the physiological reproductive periods analyzed, as shown in Table 1.

In the analyses of the group of non-pregnant mares in the different periods analyzed, there was no significant difference in the variables ($P < 0.05$), as shown in Table 2.

Table 2 – Mean values \pm standard deviations of erythrogram of pregnant mares in different gestation periods

Erythrogram	0-30 days of gestation	60-90 days of gestation	120-180 days of gestation	Reference values*
Hematias ($\times 10^6/\text{ul}$)	7.03 ± 0.13	$5.78 \pm 0.89^*$	6.85 ± 0.16	6,8 -12,9 ($\times 10^6/\text{ul}$)
Hemoglobina (g/dL)	11.5 ± 0.28	$9.6 \pm 0.94^*$	11.33 ± 0.35	11-19 (g/dL)
Hematocrit (%)	33 ± 0	$28.2 \pm 3.34^*$	32 ± 3.60	32-53 (%)
MCV ¹ (fL)	47.1 ± 3.54	49.54 ± 3.60	46.66 ± 5.05	37-59 (fL)
CHCM ² (%)	34.85 ± 0.91	34.58 ± 2.32	33.37 ± 1.85	31-39 (%)

*WEISS & WARDROP (2010). 1 Mean globular volume. 2 Mean Globular Hemoglobin Concentration. *The red cells indicate that the value found is below the reference value for the species.

However, for pregnant women between 60 and 90 days of age, the values of red blood cells, hemoglobin and hematocrit were lower than the reference values, in agreement with Couto (2010), in a study carried out with native mares, concluding, in the evaluation of the erythrogram, a decrease in the values of erythrocytes, hemoglobin and globular volume in mares with 90 days of gestation, justified by the expansion of plasma volume in response to the increase in the concentration of renin in the plasma and consequent slight reduction of levels of atrial natriuretic peptide, and it is also linked that the increase in plasma volume is the result of systemic vasodilation and increased vascular capacity.

In mares less than 30 days of gestation there were no changes in the reference values. This is justified by fetal recognition, which occurs only after 30 days of gestation, therefore, there are no sudden changes in these values.

In the group of pregnant women between 120 and 180 days, erythrogram values were within the reference values. Cunningham (2008) states that the total erythrocyte count is closely linked to the body's need for oxygen, that is, as the demand for oxygen increases, the amount of red blood cells increases, due to the release of erythropoietin resulting from the release of progesterone and placental chorionic somatotropin, which act mainly at the end of pregnancy, raising red blood cell levels. This justifies the increase in erythrocyte value between the periods of 30 to 60 days and 120 to 180 days.

Table 3 – Individual erythrogram values of each mare belonging to the group of pregnant mares and their respective gestation time.

Gestation time	Animal	Erythrocytes	Hemoglobin	Haematocrit	VCM	CHCM
30 d gestation	Tordilla	6,65*	11,7	33	49,6	35,5
30 d gestation	Lorinha	7,4	11,3	33	44,6	34,2
60 d gestation	Ravika	6,05	10,8	31	52,2	38,4
60 d gestation	Successor	6,2	10	31	50	32,2
60 d gestation	Girl	5,7	9,1	27	47,4	33,7
60 d gestation	India	4,3	8,3	23	53,5	34,8
90 d gestation	Crazy	6,65	9,8	29	44,6	33,8
120 d gestation	Mega sena	6,67	11	31	46,5	35,5
120 d gestation	Queen	6,95	11,7	36	51,8	32,5
180 d gestation	Brysa	6,95	11,3	29	41,7	32,1
Reference values*		6,8 -12,9 (x10 ⁶ /ul)	11-19g (g/dL)	32-53 (%)	37-59 (fL)	31-39 (%)

*WEISS & WARDROP (2010).1 Mean Globular Volume. 2 Mean Globular Hemoglobin Concentration. *The red cells indicate that the value found is below the reference value for the species.

Table 3 shows the erythrogram values of the pregnant mares, classified according to the gestational period at the time of collection. All animals pregnant between 60 and 90 days had normocytic normochromic anemia. Souza et al. (2002) reported that this "physiological anemia" in the first third of pregnancy occurs due to blood hemodilution, since the expansion of the plasma

volume is greater than the expansion of the erythrocyte mass. The authors also state that erythrocytes should remain this way until the puerperium, around 6 to 8 weeks postpartum.

Some animals aged 30 and 120 to 180 days pregnant had red blood cells/hematocrit values below the reference values, but they do not qualify as truly anemic.

Regarding the leukogram, there was no significant difference ($P < 0.05$), except for monocyte counts, which were higher for pregnant women, but without clinical significance, since they remained within the reference values (WEISS & WARDROP, 2010).

For the other variables analyzed between the groups, there was no statistical difference, as well as Couto (2010), who demonstrated that no significant difference was observed between the leukograms of empty mares, with three, six and ten months of gestation.

Table 4 – Mean values \pm standard deviations of leukocyte count of pregnant and non-pregnant mares.

Leukogram	Pregnant	Non-pregnant	Reference values
Total Leukocytes	10.515 \pm 3377,5	10.168 \pm 3.172,33	5.400-14.300 ul
Rod neutrophils	0 \pm 0	0 \pm 0	0-1.000 ul
Segmented neutrophils	6.802,60 \pm 2751,24	6.363,8 \pm 2218,57	2.260-8.580 ul
Eosinophils	377,60 \pm 463,28	619,3 \pm 870,15	0-1.000 ul
Basophils	23,20 \pm 37,61	61,9 \pm 95,24	0-290 ul
Monocytes	422 \pm 240.08 A	204.6 \pm 126.12 b	0-1.000 ul
Lymphocytes	4341,90 \pm 5285,87	2947,7 \pm 1059,43	1.500-7.700 ul

ab Equal letters represent equal means, different letters indicate statistical difference, $P < 0.05$. *WEISS, D.J. & WARDROP, K.J. (2010). For both groups, all the means of the variables analyzed in the leukogram were within the reference values for the species (WEISS & WARDROP, 2010).

In the leukogram of the group of pregnant mares, only two animals present leukocytosis due to the increase in the number of segmented neutrophils. In both cases, the animals were less than 60 days pregnant.

In the group of non-pregnant mares, only one mare had leukocytosis due to the considerable increase in the number of eosinophils.

Table 5 – Mean values \pm platelet standard deviations and total plasma protein count of pregnant and non-pregnant mares.

	Pregnant	Non-pregnant	Reference values
Platelets	249,8 \pm 54,86	287,8 \pm 30,32	100-350 ul
Total plasma proteins	7.08 \pm 0.44	6,94 \pm 0,34	5.8-8.7 g/dL

*WEISS, D.J. & WARDROP, K.J. (2010).



The values of total plasma protein and platelet did not show significant difference (Table 3), being within the reference values (WEISS & WARDROP, 2010).

The results are in line with Bazzano et al. (2014), who analyzed the plasma concentrations of pregnant mares and observed a significant increase in parameters close to calving. Like the above-mentioned author, Campelo (2008) also found differences between the concentrations of PPT in the middle and final third of gestation of the animals analyzed.

CONCLUSION

The analyzed variables, erythrogram, leukogram, platelet count and total plasma protein did not show significant difference between the groups of pregnant and non-pregnant mares. However, all mares that were in the gestation period between 60 and 90 days presented a picture of normocytic normochromic anemia, justified mainly by blood hemodilution, characterizing the stage of gestation that requires more attention by owners and veterinarians.




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Quality management in an agricultural research company in the Brazilian Amazon

 <https://doi.org/10.56238/sevned2024.014-017>

Jamile da Costa Araújo¹ and Marcella Nunes de Freitas²

ABSTRACT

The quality assurance process offers direction on how the team will oversee and confirm the standard of the project during its implementation. This case study aims to analyze the quality management of Research, Development, and Innovation projects at a public agricultural research company unit in the Amazon, located in the state of Amapá. It will also investigate how specific regional characteristics affect project execution while identifying areas for improvement. The study uses qualitative and quantitative methods, and its findings will provide valuable insights for project managers and stakeholders in the field. Data from the corporate project management system was analyzed to verify project execution and identify obstacles. The system data was gathered from the reference Unit, Amapá, and three other research Units of the same company located in the North, Midwest, and South. Biased and emotional language was avoided in favor of a clear, objective narrative. The Cause and Effect Diagram and the Pareto Chart were utilized to prioritize the problems to be analyzed. Technical abbreviations such as Cause and Effect Diagram and Pareto Chart were introduced and defined upon their first use. The document adhered to standard academic structure, formatting, and citation methods. Finally, the 5W2H technique was employed to develop the action plan. Project management is conducted in a standardized manner with monitoring taking place every four months. The primary cause of delays in project activities at the Reference Unit is a shortage of materials, supplies, and equipment during the scheduled period. This issue is mainly attributed to delays in the transfer of financial resources and the challenge of acquiring these items. The action plan recommends diversifying funding sources, modifying the physical-financial schedule, and providing training to teams in risk management and procurement management.

Keywords: Development, Innovation, Amapá, Management, Quality tools.

¹ Doctor in Animal Science
Institution: Brazilian Agricultural Research Corporation.
E-mail: jamile.costa@embrapa.br

² Doctor in Plant Science
Institution: University of São Paulo (USP/Esalq)
E-mail: cellanunes@yahoo.com.br

INTRODUCTION

The search for quality has been with man since the beginning. The concern with the quality of materials, improvements in production methods, and food storage are some examples of the importance of quality for humanity (RODRIGUES, 2020). Quality becomes more important every day due to consumer demands and the need for more sustainable products, processes and services.

According to Rodrigues (2020), quality is the value perceived by the customer. And quality management in projects aims to ensure that the objectives of the stakeholders are met, through the planning, management and control of the established requirements, providing the customer with the desired delivery (PMI, 2017).

To promote quality management in projects, the techniques and parameters used are according to the type of delivery to be carried out (PMI, 2017). Thus, in Research, Development & Innovation [RD&I] projects in the agricultural area, several techniques and parameters can be used to manage, control and measure the quality of deliveries. Among them, it is possible to use the Cause and Effect Diagram; Pareto chart and the 5W2H methodology.

According to Grisotti and Moran (2020), the Amazon is composed of regions with unique characteristics that require unique development strategies. And that ignorance about the various "Amazons" is responsible for the delay in their development, and the recognition of this diversity should be the starting point for any discussion about development strategies in the region.

Companies with national coverage have the practice of standardizing the processes and techniques used in the different Units, however, Brazil is a country of continental dimensions and the different regions and units of the federation have peculiarities.

As a result of the great diversity of territorial conditions in Brazil, questions arise regarding project management practices, such as: is it feasible to standardize the quality management of projects executed in different regions or units of the federation? What are the impacts of disregarding the peculiarities of each region? Is this valid for Amazon?

The Brazilian Legal Amazon comprises an approximate area of 5,217,423 km², about 61% of the national territory. It includes the states of Acre, Amapá, Amazonas, Pará, Roraima, Rondônia and Tocantins, which make up the Northern Region of Brazil, in addition to Mato Grosso, and, partially, the state of Maranhão, with a population of about 27.5 million people (SANTOS et al., 2018). Its Human Development Index [HDI] is 0.683, below the Brazilian average of 0.727 (UNDP, 2013).

The state of Amapá is one of the states that make up the Legal Amazon, covering 142,470.762 km² of territory, housing an estimated population of 861,773 inhabitants. With an HDI of 0.708 and occupying the twelfth position in the ranking of Brazilian states. The state has several particularities, such as terrestrial geographic isolation from the rest of the country, border area, large preservation area (72% of the territory), among others (IBGE, 2020).

In view of the particularities mentioned, this research aimed to analyze the quality management of RD&I projects in a unit of an agricultural research company in the Amazon, state of Amapá, as well as to verify how the specific regional characteristics influence the delivery of results and identify points of improvement.

MATERIAL AND METHODS

OBJECT OF STUDY

The study was carried out based on the analysis of data from a unit of a public agricultural research company, based in the Amazon, state of Amapá.

The Unit is one of the 42 units belonging to the company and has been present in the state of Amapá since 1981, with the objective of generating technologies, products and processes that promote the sustainable development of the state and the Amazon estuary. It operates in several areas of agribusiness, such as: aquaculture and fisheries; agricultural defense; exploitation of forest resources and agricultural production systems.

CHARACTERIZATION OF THE STUDY

The research carried out was a qualitative-quantitative explanatory descriptive case study, in which the project management model used by the Unit of the studied company was analyzed, with the purpose of characterizing it and identifying points of improvement, through the analysis of project execution data contained in the corporate systems.

To analyze the regional peculiarities of the Unit, data from three other research units of the same company, with similar purposes, located in the North (N), Midwest (CO) and South (S) Regions, were used.

DATA COLLECTION

Data from 2018 to 2020 were used, obtained through RD&I project management systems and the deliveries made, specific to the company object of the study. The systems are for corporate use and therefore have restricted access to the company.

In order to analyze the quality management of the RD&I projects of the reference Unit and the other three Units (N, CO and S), used for the analysis of peculiarities, data were collected, such as:

- Number of projects in execution;
- Planned deliveries;
- Deliveries made;
- Types of deliveries;

- Follow-up reports of project activities;
- Reports of problems occurred in the execution of project activities

In addition, the corporate tools and processes were verified to monitor the results and to ensure the quality of the deliveries and their validation.

For the analysis of the reports of monitoring situations and problems, spreadsheets with quantitative and qualitative data were extracted from the company's corporate project management system by the responsible sector and provided for the analysis.

In the comparison between Units from different regions, the report data were transformed into percentages, in order to eliminate size discrepancies between the Units, and analyzed by a simple descriptive method.

The data of activities reported as "Delayed in progress" were submitted to a classification through the application of the cause and effect diagram technique, and subsequent prioritization by the Pareto Chart, then applying the 5W2H tool for the elaboration of an action plan for the reference unit.

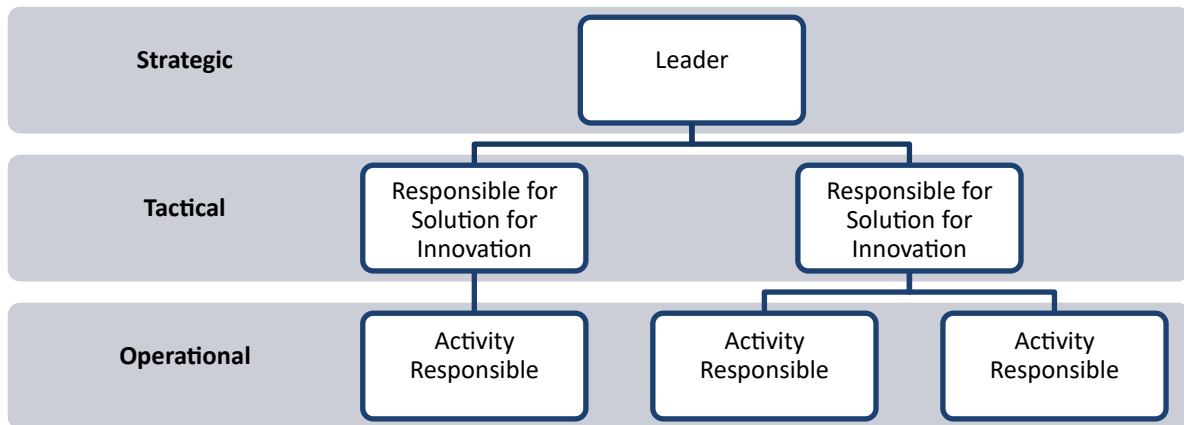
RESULTS AND DISCUSSION

The studied company follows the model of Open Innovation through the Macro Innovation Process, using a computerized system for the management of projects, from their preparation, approval, execution, to the delivery of results (products, processes or services).

The project teams are organized into a "leader", responsible for the management of the project at the strategic level, researcher of the area related to the project; Responsible for the Innovation Challenges, researchers or analysts responsible for the integration of the results of the activities for the delivery of the final results that will respond to the Challenge posed (tactical); and Responsible for the activities, researchers or analysts who develop the operational part of the project (Figure 1).

The studied company works with the Technology Readiness Level [TRL] or "Manufacturing Readiness Levels" [MRL] scale to classify the results. Figure 2 shows the results of the Unit studied according to the classification of the TRL/MRL scale.

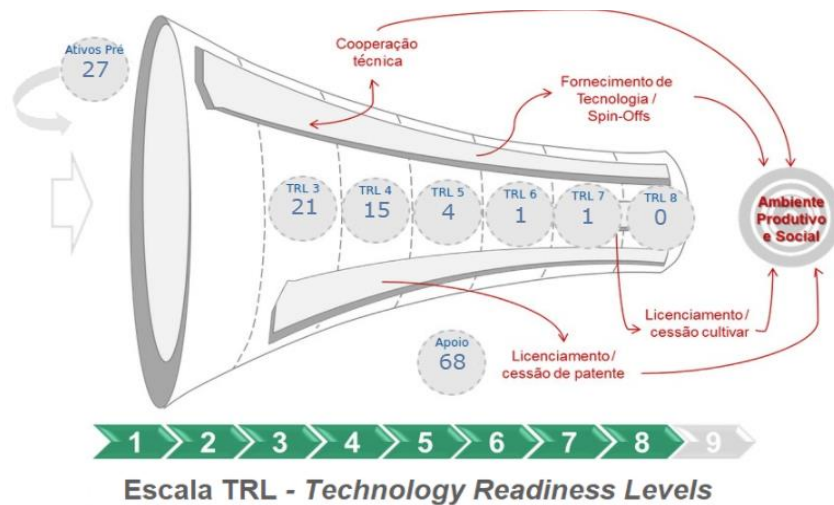
Figure 1. Levels of responsibilities of team members in the project in the studied company



Source: Original survey results

The project management system is standardized for the entire company. And the monitoring of project execution data is carried out through a computerized system, in which the person responsible for the project activities reports the progress every four months.

Figure 2. Innovation funnel of the Research Unit studied, showing the location of the assets, according to the TRL/MRL scale



Source: Project management system of the studied company

In the reports, it is necessary to choose the status of the project activity, among the options below:

- Delayed in progress;
- On-time in progress;
- Performed;
- Not informed;
- Not started and delayed;
- Not started, but on time;
- Cancellation request;

- Completion Request.

In addition, it is possible to choose the type of problem that is occurring in the execution of the activity, among the options below:

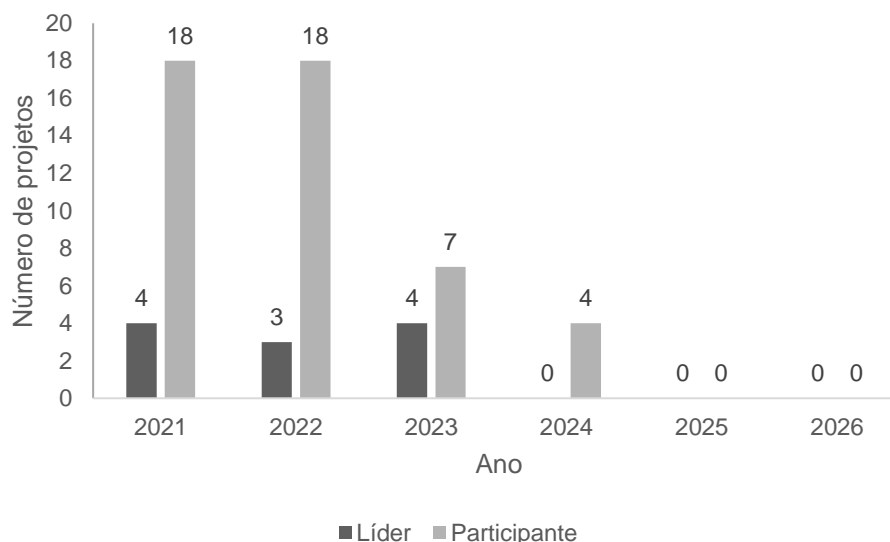
- Removal of a member from the project;
- Delay in the release of resources;
- Shortage of field labor;
- Difficulty in overcoming internal or external bureaucracy (contracts, agreements, licenses, others);
- Difficulty traveling or displacement;
- Lack of support from technical laboratory staff;
- Lack or delay in the acquisition of equipment, materials and supplies;
- No specific occurrence;
- Problems in the conduct of the activity (specify in the comments);
- Funds released in an amount lower than that requested;
- Not supplied.

In addition to choosing the situation of the activity and the type of problem, it is possible to write information about the execution of the activity.

CHARACTERIZATION OF THE UNIT

The project portfolio of the Amapá Unit consists of 47 projects, 11 of which are led by researchers from the Amapá Unit, five exclusively with researchers from the Amapá Unit and 42 in partnership with other units of the company or institutions (Figure 3), with 34.52% of the professionals involved in the research projects being external to the Unit.

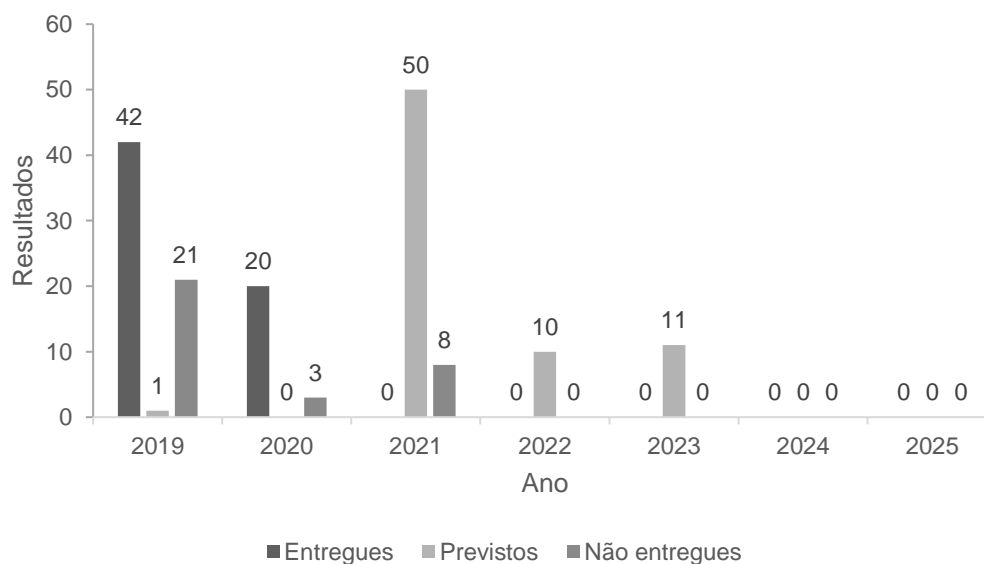
Figure 3. Number of ongoing projects with participation or led by researchers from the Research Unit



Source: Original survey results

The studied Unit delivered 42 results in 2019 and 20 results in 2020, this reduction is justified by the difficulty in carrying out the activities, due to the COVID-19 pandemic. And it reflects in the forecast results for 2021, 50 results, being 400% above the average of the forecast results for the following years, 2022 to 2023 (Figure 4).

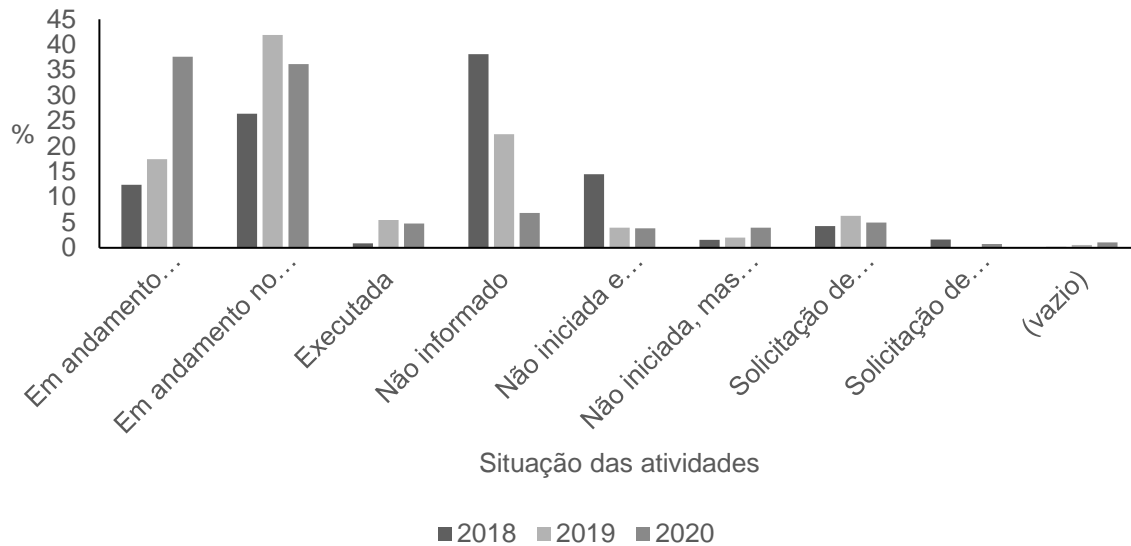
Figure 4. Forecasted, delivered and undelivered research results of the Amapá Unit in the period from 2019 to 2025



Source: Original survey results

In the follow-up reports made during the period surveyed (2018 to 2020), a considerable percentage of activities were observed with no record, "Not informed" (Figure 5). This percentage decreased during the surveyed period, from 38.13% in 2018 to 6.85% in 2020. However, it is still a considerable percentage, since information about the status of activities is essential for project management, including quality management (OTTONICAR et al., 2019).

Figure 5. Follow-up reports of the projects being carried out at the Amapá Unit



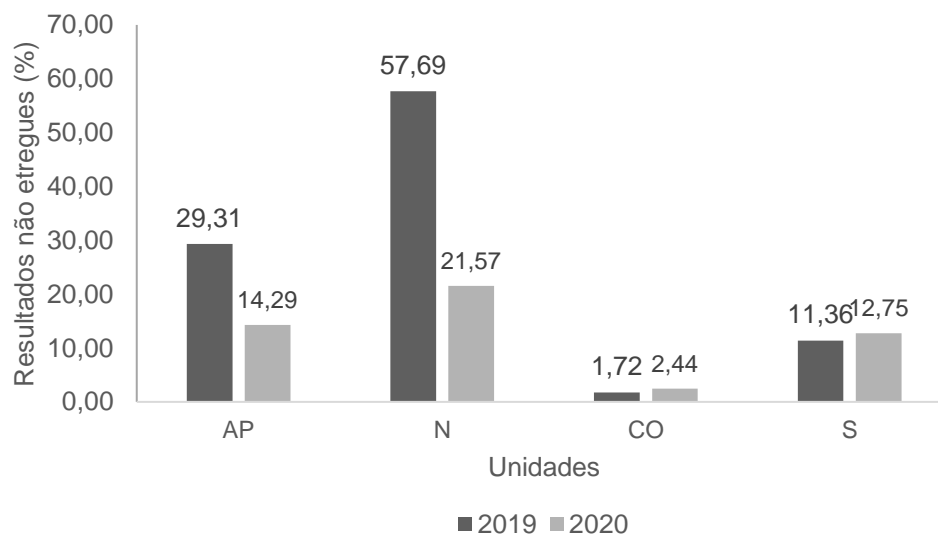
Source: Original survey results

QUIRK ANALYSIS

Although some of the company's corporate units have a project office or organizational structures with a similar function, in the corporate unit analyzed, there is no project office or project managers to assist in their management, since the Amapá Unit does not have professionals trained in project management with the objective of managing the projects executed.

When analyzing the number of results not delivered by the Amapá Unit, compared to the other Units studied, it was observed that there was a decrease in the number of results not delivered from 2019 to 2020; and that the Units in the North region had a higher percentage of undelivered results than the units studied located in other regions (Figure 6).

Figure 6. Results of undelivered projects from the Amapá [AP], North [N], Midwest [CO] and South [S] Unit from 2019 to 2020

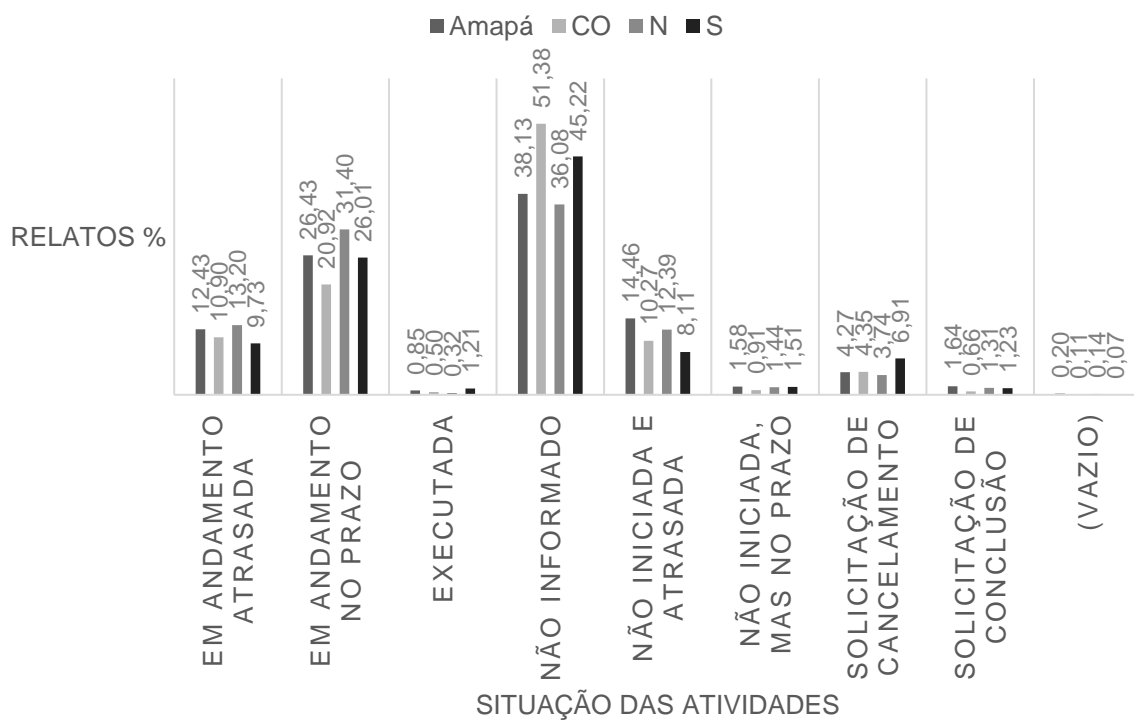


Source: Original survey results

Although the Amapá Unit had a higher percentage of non-delivered results in 2019 and 2020 than the Units analyzed in other regions, it had a lower percentage, that is, better performance than the Unit in the North region, which is also located in the Amazon. The North Unit presented 96.82% in 2019 and 50.94% in 2020 results not delivered more than the Amapá Unit.

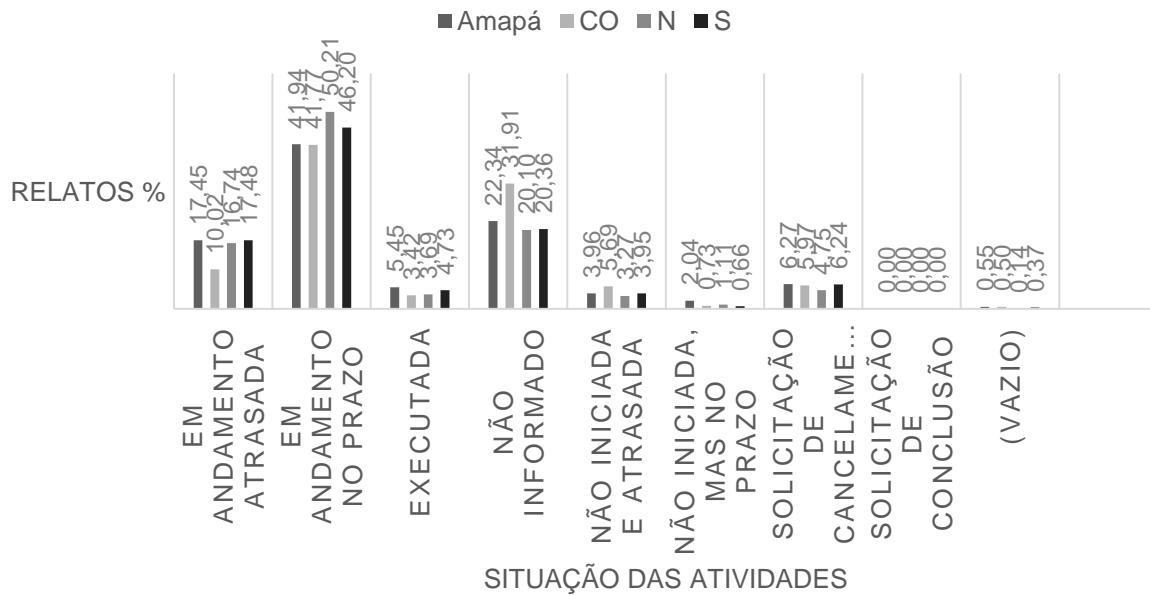
In the comparison of the reports obtained in the reference Unit, Amapá, with the other Units, it was observed that the first presented a number of activities "In Delayed Progress" close to the percentage value presented by the other Units, being respectively in 2018, 2019 and 2020 of 12.43%, 17.45%, 37.60% (Figures 7, 8 and 9).

Figure 7. Status of the activities of the projects in execution reported during the quarterly follow-up, in 2018, in the Units analyzed: Amapá [AP]; Midwest: [CO]; North: [N]; South: [S]



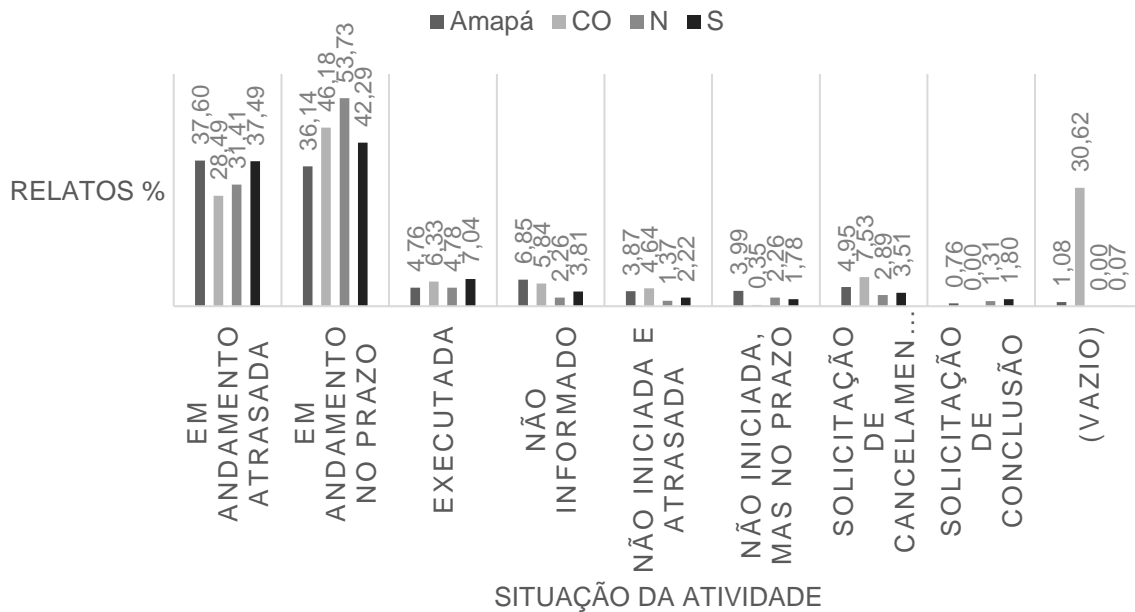
Source: Original survey results

Figure 8. Status of the activities of the projects in execution reported during the quarterly follow-up, in 2019, in the Units analyzed: Amapá [AP]; Midwest: [CO]; North: [N]; South: [S]



Source: Original survey results

Figure 9. Status of the activities of the projects in execution reported during the quarterly follow-up, in 2020, in the Units analyzed: Amapá [AP]; Midwest: [CO]; North: [N]; South: [S]



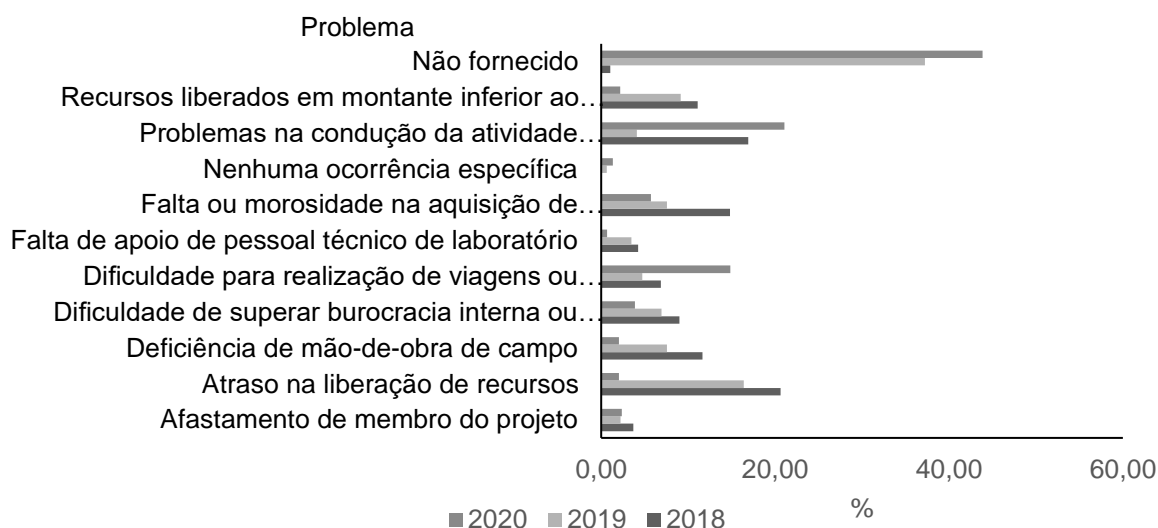
Source: Original survey results

The number of activities reported as delayed increased considerably in 2020 compared to 2019, 115.47%, at the Amapá Unit. This abrupt increase occurred due to the shutdown of several activities due to the COVID-19 pandemic in 2020.

In the Reference Unit, among the "In progress and delayed" activities, it was possible to observe that most of the reports did not report the problem related to the delay. However, among the main types of problems chosen by the reporters are "Delay in the release of resources", which ranked

first and second in reports in 2018 and 2019, respectively; "Problems in the conduct of the activity", "Lack or delay in the acquisition of equipment, materials and inputs" third place in 2018 and fourth in 2019; "Resources released in an amount lower than requested" (Figure 10).

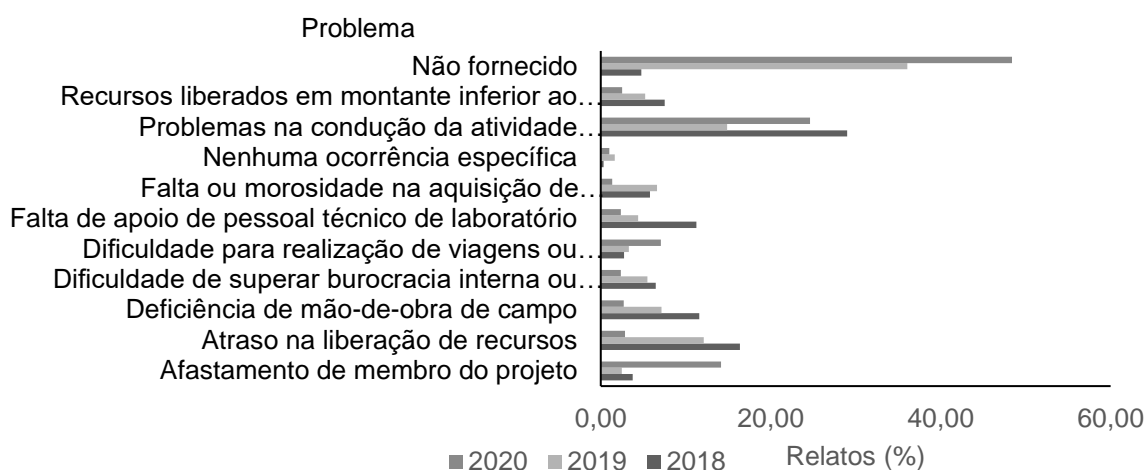
Figure 10. Problems reported for the activities of ongoing projects reported as "Late in progress" at the Amapá Unit, during the years 2018 to 2020



Source: Original survey results

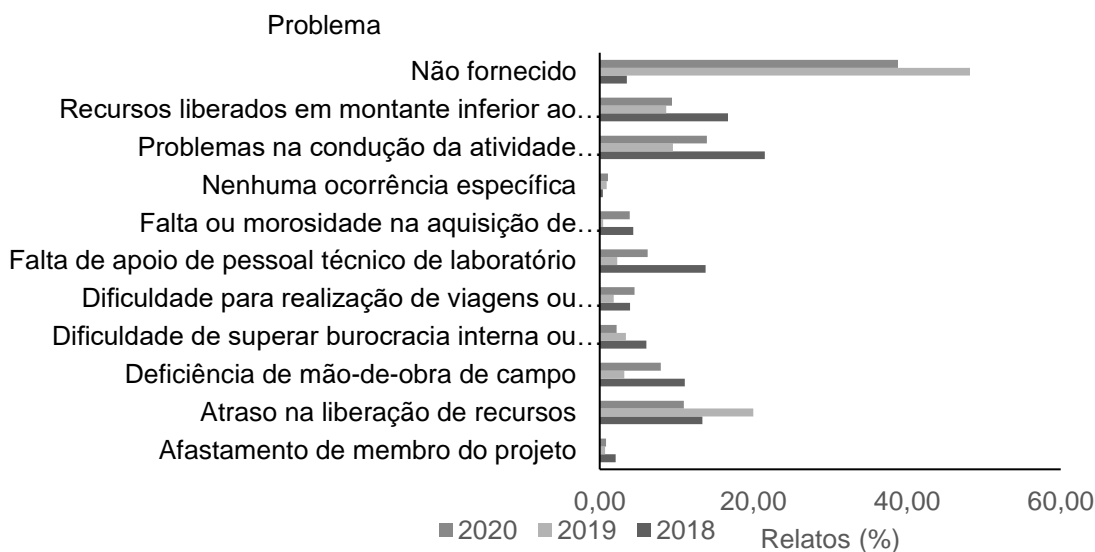
By observing the reports of problems in the other Units studied (Figures 11, 12 and 13), it was possible to verify that among the "In progress and delayed" activities, there was also a predominance of the absence of specific information about the problem that led to the delay. Thus, an improvement for the monitoring of activities would be to make it mandatory to choose one of the problem items, in activities reported as delayed, thus making it mandatory to report the problem and enabling an intervention so that the activity or result is compromised.

Figure 11. Issues reported for ongoing project activities reported as "Ongoing delayed" in the North Unit, during the years 2018 to 2020



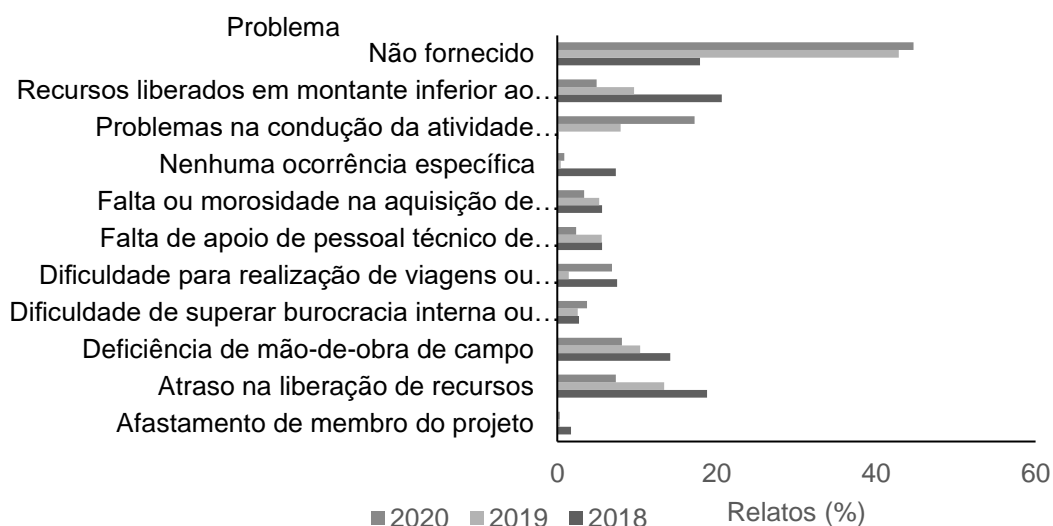
Source: Original survey results

Figure 12. Issues reported for ongoing project activities reported as "Ongoing Delayed" in the Midwest Unit, during the years 2018 to 2020



Source: Original survey results

Figure 13. Issues reported for ongoing project activities reported as "Ongoing delayed" in the South Unit, during the years 2018 to 2020



Source: Original survey results

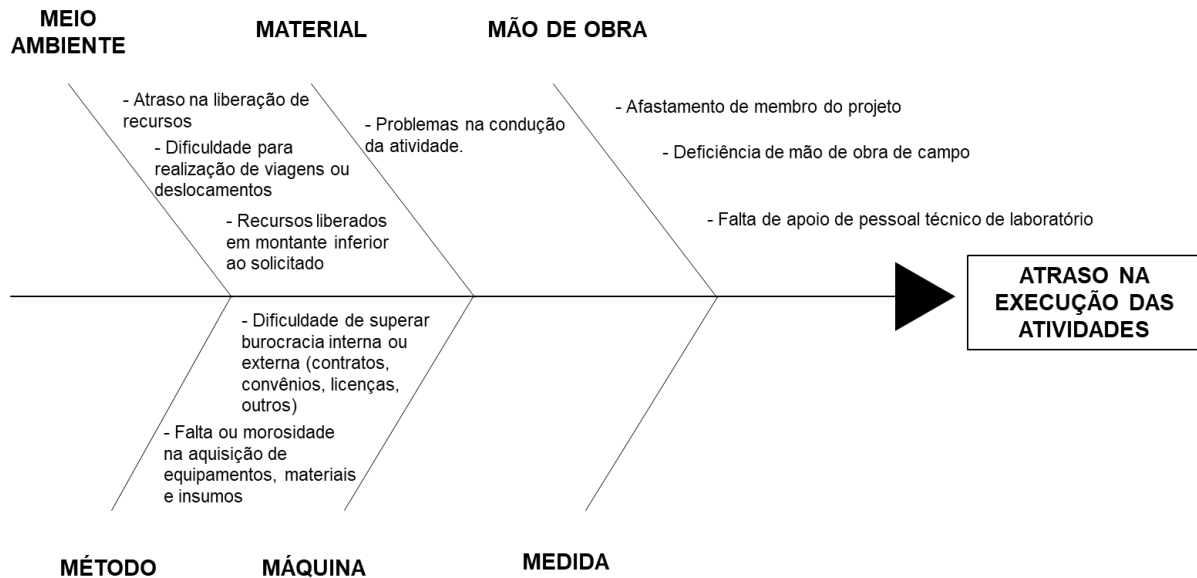
The item "Delay in the release of resources" was one of the most cited items in all the Units studied, ranking second among the items of problems in activities at Embrapa Amapá, during the study period, proving to be an important item for management.

The difficulty in making trips or displacements was an item that was among the four most cited, only in the Amapá Unit, demonstrating that this is a specific problem in this Unit. As well as the difficulty of commuting, "Lack or slowness in the acquisition of equipment" was among the main ones, fourth place during the period studied.

QUALITY REVIEWS

For a better analysis of the problems that led to the delay in projects in the Reference Unit, the reported problems were organized in a Cause and Effect Diagram (Figure 14). It was possible to observe that most of the problems are related to the environment, labor and method.

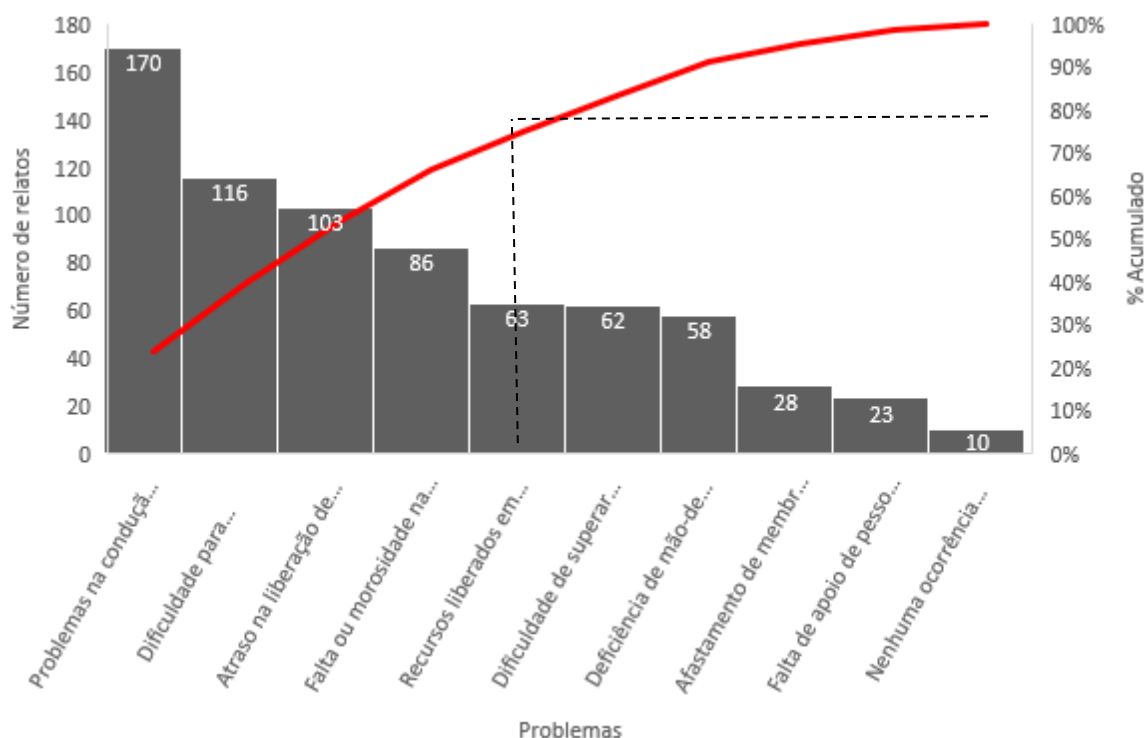
Figure 14. Cause and Effect Diagram of the overdue activities of projects executed by the Amapá Unit in the period from 2018 to 2020



Source: Original research results

Subsequently, the prioritization of the problems was carried out through the elaboration of the Pareto chart (Figure 15), which showed that 80% of the reported problems are related to "Problems in the conduct of the activity", and these reports, for the most part, are related to the lack of materials for the execution of the activities; difficulty in making trips or displacements", due to lack of resources or delay in the release of the resource; "Delay in the release of the resource", due to the delay in the release of financial resources by the financing agent; "Lack or delay in the acquisition of equipment, materials and supplies", related to the absence of essential materials for the execution of activities; "Resources released in an amount lower than requested", due to budget cuts by the financing agent.

Figure 15. Pareto chart of problems related to the delay in project activities executed by the Amapá Unit in the period from 2018 to 2020



Source: Original research results

After prioritization using the Pareto chart and analysis of the qualitative data of the reports, the 5W2H tool was applied as a proposal for an action plan for the reference unit (Table 1).

Table 1. Table 5W2H for the problems prioritized through the Pareto chart, related to the delay in project activities executed by the Amapá Unit in the period from 2018 to 2020

Root Cause	What?	Who?	Why?	Where?	When?	How?	How much?
Problems in the conduct of the activity (specify in the comments)	Improve the acquisition of materials necessary for the execution of research activities	Responsible for procurement activities and sector	Avoid delaying or paralyzing activities due to lack of materials	Research Sector (Project Proposal/ Material Procurement Process)	In the preparation of the project/ request for acquisitions / moment of acquisition of materials	Plan the early acquisition of materials/Seek less bureaucratic and more effective procurement paths	Free of charge
Difficulty traveling or displacement	Set aside material and financial resources for the beginning of the fiscal year.	Responsible for procurement activities and sector	Avoid the paralysis of travel due to lack of financial resources	Research Sector (Project Proposal - Physical-Financial Schedule)	In the elaboration of the project	Plan for the early acquisition of materials needed for travel (e.g. fuel) / diversify sources for project financing and reserve financial resources of greater	Cost of adapting the proposal for submission to other funding agents.

						flexibility for the annual period prior to the release of financial resources	
Delay in the release of resources	Adapt project budget planning to the annual financial release schedule	Activity Leader/ Project Leader	Avoid delaying or paralyzing activities due to lack of financial resources	Research Sector (Project Proposal - Physical-Financial Schedule)	In the elaboration of the project	Plan for the advance procurement of materials for the annual period prior to the release of funds	Free of charge
Lack or delay in the acquisition of equipment, materials and inputs	Develop/use more efficient strategies for the acquisition of equipment, materials, and inputs	Procurement Team	Execution of acquisitions on schedule	Procurement (Procurement Processes)	Prior to the material acquisition period	Use specific legislation for Research, Development & Innovation procurement purposes to simplify processes/ Generate a supplier bank	Cost of team training/Cost of hours worked to generate a supplier database
Funds released in an amount lower than requested	Diversification of resources and preparation of risk plan	Project design team	Prevent the execution of activities from being impaired/unfeasible due to lack of financial resources	Research Sector (Project Proposal - Management Plan)	In the elaboration of the project	Develop risk response plan (risk management)	Cost of adapting the proposal for submission to other funding agents/ Cost of preparing a risk management plan for the project

Source: Original research results

As a proposal for improvement in the execution of projects and delivery of results by the Reference Unit, it is also suggested:

- Increase in the number of reports to monitor project activities, changing the period from quarterly to monthly;
- Implementation of a project office and the training of a project manager, for a more effective monitoring, aiming to reduce the response time to problems that occur;
- Implementation of project risk management, with preparation of risk management plan;
- Implementation of a system for recording and sharing lessons learned;
- Continuous use of the "Plan, do, check and act" [PDCA] cycle to solve the identified problems.



FINAL THOUGHTS

The studied corporate unit presented several points of improvement to be worked on in relation to quality management, with emphasis on the delays in the execution of activities and consequent non-delivery of project results.

The deliveries of project results not carried out by the studied Unit were considerably higher than the deliveries not made by the units located in other regions of the country, although the number of activities reported in arrears was similar. This fact requires the attention of the management of the Company and the Units to verify the causes and solution of this situation.


It was also observed that most of the problems that cause delays in project activities in the reference unit, Amapá, are related to the lack of materials, inputs and equipment in the scheduled period, which is mainly due to delays in the transfer of financial resources and the difficulty in acquiring materials, inputs and equipment. Thus, the action plan suggested the diversification of financing sources, adequacy of the physical-financial schedule, taking into account the financial release period in previous years and the training of teams in risk management and acquisition management.



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Childhood and the right to happiness: Legal scope and the support network in Arapiraca

 <https://doi.org/10.56238/sevned2024.014-018>

Mahely Corrêa Bezerra¹, Lenivaldo Manoel de Melo², Lucicleide da Silva³, Júlio Gomes Duarte Neto⁴ and Marcos Alexandre da Silva⁵

ABSTRACT

The article addresses the results of the extension project of the State University of Alagoas – UNEAL, "Protected Child is Happy Child", whose objective was to identify the dynamics of the functioning of the child support network in the municipality of Arapiraca in the state of Alagoas, as well as the measurement of the types and dimension of violence practiced/identified. The praxis of extension implied the holding of workshops in toy libraries and early childhood education schools for the dissemination and distribution of an educational booklet produced after dialogue with actors of the existing protection network in the municipality, in the security forces and in the judiciary. A study of the statistical data of the care records carried out by the protection network in the years 2020; 2022 and 2023 (Children's Police Station, the Guardianship Councils of Arapiraca and the Sopia and DataSUS system) indicates a higher incidence of violence against children in poorer neighborhoods, but cases are identified in all neighborhoods, regardless of the purchasing power of their population. In the categorization of the types of violence, negligence was identified as a strong reason for families to go to the Guardianship Council; next, school education; then psychological or physical aggression; life & health or drugs; and sexual abuse. Interestingly, the mother is identified as the aggressor in a large number of cases. Symmetry is observed in the informants' databases, and the lack of daycare centers and full-time school is identified in some neighborhoods of the municipality, catalyzing intrafamily violence.

Keywords: Violence, Childhood, Support networks, Protection.

¹ Master in Business Management
Institution: State University of Alagoas (UNEAL)
Address: Arapiraca, Alagoas, Brazil
E-mail: mahely.bezerra@uneal.edu.br

² Master of Business Administration
Institution: State University of Alagoas (UNEAL)
Address: Arapiraca, Alagoas, Brazil
E-mail: lenivaldo.melo@uneal.edu.br

³ Doctor in Education
Institution: State University of Alagoas (UNEAL)
Address: Arapiraca, Alagoas, Brazil
E-mail: lucicleide@uneal.edu.br

⁴ Specialist in Criminal Sciences
Institution: State University of Alagoas (UNEAL)
Address: Arapiraca, Alagoas, Brazil
E-mail: julio.gomes@uneal.edu.br

⁵ Statistician Specialist
Institution: State University of Alagoas (UNEAL)
Address: Arapiraca, Alagoas, Brazil
E-mail: marcos.alexandre@uneal.edu.br

INTRODUCTION

This work develops the analysis of quantitative and qualitative data on the omission or action that harms the well-being of children and adolescents, and experiences acquired in the extension & research project of the State University of Alagoas/UNEAL. The study took place in the city of Arapiraca-AL, which has a territorial area of 345,655 km², population estimated by IBGE (2022): 234,696 inhabitants, within the scope of social policies and practices for the protection of children and youth in the Municipality.

In partnership with the 1st District Court of Arapiraca-AL, Childhood, Youth and Family, organized by the Law and Pedagogy courses, the community and the intervening bodies, in a contribution from the judiciary/solidarity. Which contributed with an awareness and education campaign, bringing information and safety to infants and their families.

The study investigated the problem of prevention of child violence, in Law No. 8.069/1990, that according to Silva, L. (2002), domestic violence within the family is difficult to be detected, in the family environment, on the basis of this full protection, in "Art.5 where no child or adolescent shall be the object of any form of neglect, violence, [...]", asked the project participants for the quantitative data of the services, the convergence, where it happens, going to the heart of the problem.

The work had the objective of raising awareness and educating about the motivations of who the victims of child domestic violence would seek help from, for this were held meetings with partners, lectures with the delivery of a booklet in the schools of Arapiraca/AL. giving possible directions to assert a child's right to have a happy childhood.

In the primary hypothesis, the research focused on laws, articles, books and the project to analyze the guarantees of children and adolescents. And to question how they would be protected, what their ages, ethnicity, and possible solutions are. In the secondary hypothesis, the role of the state and public policies in connecting the intervening agencies in the search for protection for children who are victims of some type of violence.

It is understandable in this and in these discussions that it was decided to carry out the study, in order to identify the characteristics of these families that coexist in an environment of violence, according to the ECA - "Art. 130 - if there is a hypothesis of mistreatment, sexual abuse or oppression exercised by parents or guardians, the judicial entities must indicate, [...]", the departure of the aggressor from the home. The importance was to propose an analysis of the quantitative data related to the reception/protection networks for children and adolescents who are victims of violence in Arapiraca-AL, in a perception of Brazil.

The inclusion and exclusion criteria followed the objective of the project, which were the last 15 (fifteen) years in the researched articles and the qualitative and quantitative data, where

educational and prognostic workshops were held in person with basic education students. The inclusion of articles, or the production of educational material that detected the way in which the theme has already been addressed in other articles, and as the departure of the aggressor from the house in which he lives, there was the provisional fixation of maintenance for the aggressor's dependents, as a precautionary measure, Law No. 12,415, (2011).

Regarding aggression in homes, children are oppressed not to report the mistreatment, causing suffering, and in more serious cases even their death, as happened in Brazil in 2021, Rio de Janeiro, and which ended up becoming the Henry Borel Law, Law No. 14,344 of 2022, in the definition of Azevedo and Guerra (2001) below on what is Child Violence:

Any act or omission committed by parents, relatives or guardians against children and/or adolescents that, being capable of causing physical, sexual and/or psychological harm to the victim, implies a transgression of the adult's power/duty to protect and, on the other hand, a objectification of childhood, that is, a denial of the right that children and adolescents have to be treated as subjects and people in a peculiar condition of development.

In the case of the boy, Henry Borel, it can be seen⁶ that most of the studies published on violence against children, in Brazil and in the world, that most cases are connected to the experience of violence inflicted by parents in childhood, given that child violence in some cases may result in the death of the child, a double victim in homicide statistics. (Rates S.M.M *et al.* 2015) and (Emery CR, *et al.* 2014).

THEORETICAL FRAMEWORK

In her autobiography, Christie, Agatha (1890-1976), "One of the most fortunate things that can happen to us in life is to have lived a happy childhood." Thinking about the full priority of children and adolescents, article 227 of the Federal Constitution of 1988 determines that it is the duty of the family, society and the State to ensure to children and adolescents, with total primacy, the right to life, health, food, education, leisure, professionalization, culture, dignity, respect, freedom and family and community life and other forms.

In this analysis, the philosophical conception of the child's happiness, cited by Christie, in the text above, is not the objective. For now, understand how to have guaranteed fundamental and basic rights in legislation, and the existence of having a chance at life in the conception of Ralf Dahrendorf⁷ (1996), in the squaring of the circle, which brings social welfare.

⁶ Henry Borel, In the article, "Law No. 14,344/2022 (Henry Borel) and family law: reflections and applications", describes the main aspects of the law and deals with the importance of the effective implementation of protective measures to prevent and combat violence against children, according to lawyer Barbara Heliodora de Avellar Peralta, vice president of the Family Relations Commission of the Brazilian Institute of Family Law, Rio de Janeiro section – IBDFAM-RJ.

⁷ For a better understanding of the theoretical "concept" of life chances. DAHRENDORF, Ralf. 1996. Squaring the Circle: Economic Well-Being, Social Cohesion and Political Freedom. Lisbon, Edições 70.



What does the word "violence" mean, according to the World Health Organization (WHO), Krug *et al.* (2002) "the intentional use of force and physical power, in fact or as a threat, against oneself, against another person, or against a group or a community that results or has any possibility of resulting in injury, death, psychological harm, developmental disability, or deprivation." According to Gauer (2000), physical or moral constraint, use of force, coercion, distorting the meaning of what has been said, establishing the opposite of the right to justice, which is tragically based on the data, giving oneself to ethics, denying the free manifestation that the other expresses of himself or his convictions.

The phenomenon of domestic and/or intra-family violence against children and adolescents according to Rascovsky (1974); Azevedo (1988) apud Silva, Lygia. (2002), comes from Western mythology where they were narrated, so it is not a contemporary phenomenon. Reports of filicide have been found in biblical passages, in initiation rituals or passage to adulthood, and an intrinsic connection with the cultural history of humanity is observed, of which we will cite reports of mistreatment, neglect, abandonment, and sexual abuse. Seen in Azevedo and Guerra (2001), 04 types of violence against children and adolescents often occur, I will mention them: Sexual Violence, Physical Violence, Psychological Violence, and Negligence.

For several centuries, Weber, *et al.* (2004), the figure of childhood was linked to St. Augustine, 354-430 A.D., who declared that there was no infantile innocence, it was a practice instituted without any sanction, since in the established relationship, the father had powers of life or death over his children. In the article by Ricas *et al.* (2010), stated that the first known written law for the care of children and adolescents was in 374 AD, prohibiting infanticide.

In Brazil, the first code designed for the rights of children and adolescents was approved, the "Code of Minors", created on October 12, 1927, which initiated the concern with children and adolescents who were homeless, without a way to support themselves or anyone to support them, and eventually in an "irregular situation". homeless, "abandoned", easily influenced to enter the world of crime.

At the international level, the ten detailed principles of the Universal Declaration of the Rights of the Child, which was adopted by the UN General Assembly on 20/12/1959, in Marangon (2007, p. 163), are of sublime importance:

Principle 1 - The child shall enjoy all the rights set forth in this Declaration. All children, absolutely without exception, shall be entitled to these rights, without distinction or discrimination on grounds of race, color, sex, language, religion, political or other opinion, national or social origin, property, birth or any other condition, whether theirs or their family's. Principle 2 - The child shall enjoy social protection and shall be provided with opportunities and facilities, by law and other means, to enable him or her to develop physically, mentally, morally, spiritually and socially, in a healthy and normal manner and in conditions of freedom and dignity. In establishing laws for this purpose, the best interests of the child shall be taken into account. Principle 3: From birth, every child shall have the right to a name and a nationality. Principle 4 - The child will enjoy social security benefits. They



will have the right to grow and raise themselves in good health; To this end, both the child and the mother will be provided with special care and protection, including appropriate pre- and postnatal care. The child shall have the right to adequate food, recreation, and medical care. Principle 5: Children who are physically, mentally or socially incapacitated shall be provided with the special treatment, education and care required by their peculiar condition. Principle 6 - For the complete and harmonious development of his personality, the child needs love and understanding. He or she shall be brought up, whenever possible, in the care and responsibility of his parents and, in any case, in an environment of affection and moral and material security, except in exceptional circumstances, the child of an early age shall not be separated from the mother. Society and public authorities will have an obligation to provide special care for children without families and those who lack adequate means of subsistence. It is desirable to provide official and other aid for the maintenance of the children of large families.

Principle 7 - The child shall have the right to receive education, which shall be free and compulsory at least at the primary level. An education will be provided which will promote its general culture and enable it, under conditions of equal opportunity, to develop its aptitudes, its capacity for judgment and its sense of moral and social responsibility, and to become a useful member of society. The best interests of the child will be the guideline to guide those responsible for their education and guidance; This responsibility lies first and foremost with the parents. The child will have ample opportunity to play and have fun, aiming at the very purposes of his education; Society and public authorities shall endeavour to promote the enjoyment of this right. Principle 8 - The child shall, in all circumstances, be among the first to receive protection and help. Principle 9 - The child shall enjoy protection from any form of neglect, cruelty and exploitation. It will never be trafficked in any form. The child shall not be allowed to be employed before the minimum suitable age; In no way shall he be led to or permitted to engage in any occupation or employment which is detrimental to his health or education or which interferes with his physical, mental or moral development. Principle 10 - The child shall enjoy protection against acts that may give rise to racial, religious or other discrimination. It will be created in an atmosphere of understanding, tolerance, friendship among peoples, peace and universal fraternity, and in full awareness that their efforts and abilities must be put at the service of their fellow men (Declaration of the Universal Rights of the Child, 1959).

In Brazil during the dictatorship, 1979, the second Minor Code only maintained the doctrine of the irregular situation of infants, who were homeless, the same considerations as the first Code, cited in the previous paragraph. However, in nineteenth-century Brazil, Arthur Moncorvo Filho worked and gave the first signs through his work in the defense of childhood, in 1880 through the foundation of the Institute for the Protection and Assistance of Children, RJ. In Paris, when the interest in child protection began, it was through the Societies for the Protection of Children, (Donzelot, 1980, p. 32):

In 1865, the first societies for the protection of children appeared in Paris (founded by A. Meyer), and later in Lyons, which assumed as their objective to guarantee the medical inspection of children placed by their parents in nursing mothers, and also to improve the systems of education, methods of hygiene and the supervision of children of the poor classes. In their magazines, for example, they keep the rubric "crimes and accidents", where all the facts indicative of maltreatment, all the crimes of "non-vigilance" committed by the parents are mentioned. These societies rely on employers' committees that already existed for the surveillance of children in the asylum.

Such narratives are rich in expressing situations of mistreatment, of violence that parents/guardians inflicted on their children and adolescents, usually justified as a disciplinary

measure, to convince them to obey, but often these infants ran away from home, causing a huge number of children living on public roads.

Thus, in the mid-80s, in Brazil, the first spaces began to be created with the objective of denouncing and forwarding cases of violence practiced by parents or guardians against their children. The Regional Center for Attention to Child Abuse (CRAMI) was founded on July 4, 1985, on the initiative of Dr. Hélio de Oliveira Santos, linked to the Pontifical Catholic University of Campinas (SP).

According to Rates *et al.* (2015), Brazil has been advancing in the protections and rights of children and adolescents, as already mentioned in the Federal Constitution (1988), article 227, values the duties of the family, society and the state in the protection, rights and guarantees of children and adolescents. Thus, the ECA - Statute of the Child and Adolescent, Law 8.069 of 1990, a historical milestone, in this victory of the rights and guarantees of infants.

Supported by Law No. 8,242 of 1991, the creation of the National Council for the Rights of Children and Adolescents – CONANDA, governed by Decree No. 5,089 of 2004. In accordance with the ECA, Law 8.069/1990, art. 88, item II, and the Constitution of the State of Alagoas, of 1989, in its art. 268, and instituted by State Law No. 5.336/1992, the creation of the State Council for the Rights of Children and Adolescents of Alagoas - CEDCA/AL. In Arapiraca, Municipal Law No. 1.694/1991, took care of the creation of the Municipal Council for the Rights of Children and Adolescents of Arapiraca/AL, which was modified by Law No. 2,741/2011 and today Municipal Law No. 3,351/2019.

From the perspective of Platta *et al.* (2020), during the moment of social isolation caused by COVID-19, an ambiguous contradiction was observed regarding the protection of children and adolescents, since in order to protect them from the COVID-19 virus, they were left at the mercy of domestic violence, in an unsafe environment. The authors state that social organizations and non-governmental institutions, in the media, report an increase in violence against children and adolescents in the pandemic, there was 7.4% in the Federal District, 73% in Paraná, 8.5% in Rio Grande do Sul and 32% in Pernambuco.

In the resilience of the pandemic scenario, Law No. 13,979 was amended, and Law 14,022/20 was sanctioned, which provides for measures to combat domestic and family violence against children, adolescents, elderly people and people with disabilities, during the pandemic of the new coronavirus. It is intended to remember forms of reception that meet the well-being of the child: Sinase Law – National System of Socio-Educational Care/Law No. 12.594/2012; Menino Bernardo Law/Law No. 13,010/2014; Early Childhood Law/Law No. 13,257/2016 and Listening Law/Law No. 13,431/2017, and other types.

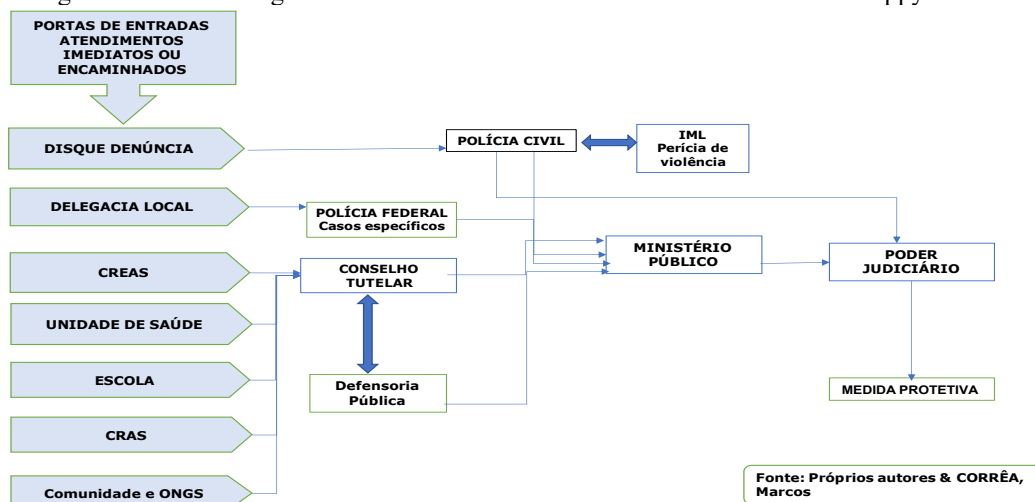
In emotional difficulties, Rubin *et al.* (2009), of which will be divided into "03 cycles of difficulties", in the 01(one) socio-emotional cycle (anxiety, low self-esteem, depressive symptoms and internalized problems), studies indicate that boys are more prone to more socio-emotional difficulties than girls. This is followed by cycle 02 (two) difficulties with peers (rejection, victimization and poor quality of friendships) and finally cycle 03 (three) school difficulties (poor quality teacher-student relationship, academic difficulties and avoiding school).

On prevention and identification, Rosas *et al.* (2006), indicate that teachers, principals and other professionals who work with children and adolescents, especially in a school environment, which is the space where the child will spend part of the day, should be attentive to the signs that the child asks for help, through their body language, their behaviors, their actions or the lack of these attitudes, which are not always through the expression or speech of a cry for help.

Currently, Law No. 12.010/2009 – Adoption Law, the practices of the institutional foster care program, every child or adolescent will have a reassessment of the situation every 6 (six) months, having 2 (two) years at most internal, in order to alleviate the suffering of these victimized children, implemented in 2021, in the 1st court of Arapiraca the Family Foster Care Program, that for each minor, families will receive (01) a minimum wage per month of "help".

In the history of Brazil, Ramos, F. & Rela, E. (2018), the children's works that enchants, had the conception of teaching and educating the children's spirit, in a culture of making, for example, the punishments of infants as something worthy and accepted by society. One will see in Mário, Saudade/1919, and in Henrique e Eduardo, A ilha perdida/1946, children's books with adult-centric contours or narratives that impose punishments on children for their disobedience, emphasizing that the fact of not following the recommendations of their elders would lead them to unpleasant situations.

Figure 1: From the Organizational Chart of the Protected Child Booklet! It's Happy in Life!



Source: Extension Shield Booklet, Protected Child, pg. 43, 2022.



In the new conception, or in practice, to whom should the children's families seek help and shelter in the event of violence? - In figure 1, several paths can be followed, in the event of reporting situations of violence against children and adolescents, one of them would be the Guardianship Council of the neighborhood, or go to the Civil and Military Police, in cases of physical or sexual violence the police station will give the referral for the forensic examination of the victim, at the IML. And in possession of the expert report of the doctor and the B.O., you can go to the Public Prosecutor's Office or Public Defender's Office, and/or through the national dial-100 hotline; Dial 181, state; and Dial 156, municipal, being informed of the facts in the call, to help in the intervention of the public authorities; in figure 1, the Organizational Chart was planned to describe some paths.

METHODOLOGY

The research had the partnership and funding of UNEAL, through meetings gathered the best ways to reach the effective model of publishing the Booklet, called: "Protected Child! It's happy in life!", (2022)⁸, distributed in schools in Arapiraca. The study was approved by the Research Ethics Committee, in compliance with the ethical guidelines, SEI under number E:04104.0000001495/2020, PROEXT order 5352752.

The planning meetings, in the first stage, were for the preparation of the UNEAL Letters of Consent and the terms of partnership with signatures of the partners/city hall in the project, where it was decided to choose 04 Secretariats of the Municipality of Arapiraca. The 100 hours of the project were completed, 40 hours completed in the stage of delivery of the Booklets in the Schools, the remaining hours remaining in the construction of the booklet and with meetings/internal/virtual at Uneal and external in the entities 60 hours. This is a study with a quantitative and qualitative approach, of a social and preventive nature, carried out in the Schools of Arapiraca/AL.

The meetings of the extension project with the partner entities, which were directly involved with the Rights, Protection and Defense of Children and Adolescents, such as: 1st Court of Arapiraca – Childhood and Youth of Arapiraca; Public Defender's Office of Arapiraca. With data from the General Civil Police Precinct (DGPC) AL; Tutelary Council I and II; Municipal Council for the Rights of Children and Adolescents (CMDCA); Specialized Reference Center for Social Assistance (CREAS). In addition to the participation of the Municipal Secretariat, of which I will mention: Social Development of Arapiraca – SMDS; of Culture, Leisure and Youth – SMCLJ; of Health of Arapiraca – SMS and Political Articulation – SMAP.

At the time of delivery to the schools, it was decided to carry out educational and prognostic workshops in person with students from basic municipal education and a state school. Thus, the visit

⁸ Physical version delivered to students and dissemination of the QR COD, available online: <https://drive.google.com/file/d/1PpcL3IJH7iPQBJZNCVdk8q9E8QyIe511/view?usp=drivesdk>

and delivery of the Booklets took place in 08 (eight) schools, 07 (seven) municipal schools and 01 (one) state school, disclosing the QR CODE. Aiming at the ECA – 8.069/1990, in this way it was feasible to make the deliveries in the pre-literacy classes – children from 03 years to 05 years, in the 2nd Grade of Elementary to 8th Grade – children/adolescents from 06 to 14 years old, and in this way the need for this integrated extension project was perceived⁹.

With the use of SPSS 20, with data from the Civil Police Station - Police Intelligence Directorate, Statistics and Analysis Section, to use the detailed graphs, and to be able to see the Frequency, with answers given in absolute terms. It included a bibliographic review of scientific articles from the last 15 (fifteen) from the Capes portal, UNEAL Digital Library and Google Scholar and other sources. Access took place between May 20, 2021 and December 2023, in which the following expressions were searched: "child violence", "law 8.069-90", "ECA", and reflections on the resilience of child victims of violence who seek protection.

In the inductive method of approach – "knowledge is based exclusively on experience, without taking into account pre-established principles," Gil, (2009); Lakatos; Marconi, (1993). According to Gil (2002), when carried out in the natural sciences, it uses the experimental method, in the social sciences, which requires the use of the observational method, in the realization of the ICF with the partner entities.

Considering the nature of the approach, quantitative research conceptualizes that anything can be quantifiable, however, it details mathematical data as a discourse to justify theories and hypotheses, Silveira (2011). In the universe of field research, the stratified probabilistic sampling criterion was observed, which will be to classify the samples by sex, age, ethnicity, etc. In the collection instruments, secondary data from the Children's Police Station, the Guardianship Council of Arapiraca, and the Municipal Health Department of Arapiraca/SMS, and the Social Development Department of Arapiraca/SMDS, with the Sapia or Datasus system, were used.

RESULTS AND DISCUSSIONS

In a project that raises awareness about the prevention of child domestic violence, and even disseminates/informs about what to do in accordance with the Statute of the Child and Adolescent – ECA, Law 8.069/1990, in addition to strengthening support networks, in prudence and strengthening rights, against child violence, in:

Article 5. No child or adolescent shall be subject to any form of negligence, discrimination, exploitation, violence, cruelty and oppression, and any attack, by action or omission, on their fundamental rights shall be punished in accordance with the law.

⁹ Photos in Next topic

And in the details in Article 18 and Article 18-A:

Article 18. It is everyone's duty to protect the dignity of children and adolescents, protecting them from any inhuman, violent, terrifying, vexatious or embarrassing treatment. Article 18-A. Children and adolescents have the right to be educated and cared for without the use of physical punishment or cruel or degrading treatment, as forms of correction, discipline, education or any other pretext, by parents, members of the extended family, guardians, public agents executing socio-educational measures or by any person in charge of caring for them. treat, educate, or protect them.

An example of this challenging context is in the book by the Scientific Committee of the Science for Childhood Center (2023) – "Prevention of violence against children", in Rio Grande do Sul, in which the families interviewed stated that they adopt negative practices, such as: screaming, shaking and spanking, on children, with 67% of the families. The use of violence as an educational process is notorious, according to (Martins *et al.* 2010), experienced by different periods of humanity and being replicated in a culture rooted over several decades. It is imperative to *invest* in children and families so that society is defined by care, and in parenting programs.

Going to the legal framework, Law 13.257/2016, which defines conditions and ideas for the design of intersectoral plans at the municipal level, for early childhood, and definition of goals by the responsible bodies, Early Childhood Observatory, (2020), "Monitoring of policies for early childhood". The articulation of public governance policies between the actors of this decision-making process and civil society so that early childhood is an efficient policy, investing in children, is achieved, in Abrucio's speech¹⁰, a "positive cascading effect on other areas," intersectorality, from the Maria Cecilia Foundation, (2023).

In order to reach multiple childhoods, the booklet "Protected Child is happy in life" was read,¹¹ in a theme that leads Children and Adolescents to be directed to learn more about their rights and duties, as well as to identify support networks, and their addresses and telephone numbers, being intervening entities linked to the guarantees of these rights of children, Figure 2.

In Figure 2, below, the project partners, hand in hand, were invited with a printed invitation and/or WhatsApp to receive deliveries of the first booklets. And at this moment of the delivery of the booklet "Protected Child, is happy in life" (2022), the handling of the booklet, its dissemination took place, thus introducing a different concept of addressing the theme of child violence, in a light and playful way, leading the reader to find their way, and their answer to what to do.

¹⁰ In the book "Early Childhood First: An Integrated Approach [...]" When you invest in children and their families, there is a great capacity, both now and in the future, to reduce vulnerabilities and inequalities and promote a better country" (pg. 26)

¹¹ Disponível online QR COD:
<https://drive.google.com/file/d/1PpcL3IJH7iPQBZNCVdk8q9E8QyIe511/view?usp=drivesdk>

Figure 2: Arapiraquinha IV Digital Library - Valfrido de Oliveira Lima Square.



Source: Extension data, image of Arapiraquinha IV, November 29th. of 2022 and Dec 13. 2022.

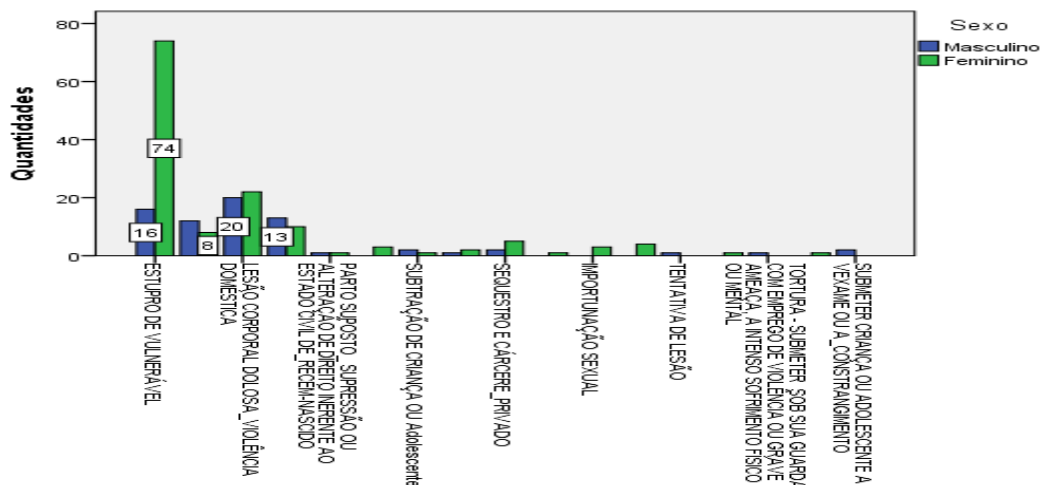
The photographic record was captured by the project team at the time of the playful dialogue about violence against children, and the importance of knowing what to do? -Denounce! (Figure 1). The second image with students from School 1, with 25 students, from the 3rd Grade, for example, in the Arapiraquinha IV Digital Library, with the library coordinator, the reading of the booklet with the use of puppets on the theme against child violence, worked on musicality making the event light and fun, with the support of the guardianship counselor. In school 2, for example, it was with the 2nd grade of elementary school, 30 students, in the school itself, with snacks, after the delivery of the booklets, there was the reading of the booklet with the participation of the students in knowing what to do? - about your rights and duties interacting with the UNEAL team.

With the puppet, children interacted and played make-believe, learning to tell everyday situations, or to report, in case there is a need, music awakens socialization between people, helping in the development of motor coordination, sound perception, linguistic improvement and other cognitive functions, Azevedo (2023). In the field of education, bioethics can be seen to reproduce some alternatives for the protection of the rights of the most vulnerable children and adolescents. In the search for fundamental human value, bioethics reflects dignity, autonomy, integrity, human rights, beneficence, and non-maleficence, (Sanches, *et al.* 2019).

THE CASES THAT REACH THE CIVIL POLICE AND GENERATE A B.O OCCURRENCE REPORT

When a family goes to the police, they want to find a resolution to a family conflict, or not, in a civilized way, by reporting such a situation. Thus, in the quotation from Donzelot, Jacques, 1980, argues that "*The police aim to ensure the happiness of the State, through the wisdom of its regulations, and to increase its forces and its power as much as it is able*", bringing the peace necessary for the maintenance of society and markets, finding the point of balance for families to live in a peaceful state, safe and democratic, and infants have a happy childhood!

Graph 1: Relating to B.O. Police Report - Crimes Committed Against Victims Age 0 to 12 by Sex Period 2015 to 2021, Jan to Sept.



Source: Data Provided by the Civil Police, Resposta_Assteac_Sic_1673-2021

In the occurrences of the B. O. Police Report; Crimes Committed Against Victims Age 0 to 12, Period 2015 to 2021, by sex, girls are the most harmed both physically and psychologically, in terms of gender. In the typology of child violence, which occurs most frequently, according to graph 1: rape of vulnerable 74 girls and 16 boys, maltreatment of 08 girls and 12 boys, intentional bodily injury 22 girls and 20 boys, abandonment of incapacitated 10 girls and 13 boys, kidnapping and private imprisonment, attempted injury, sexual harassment, subtraction of children, and others in Arapiraca-AL.

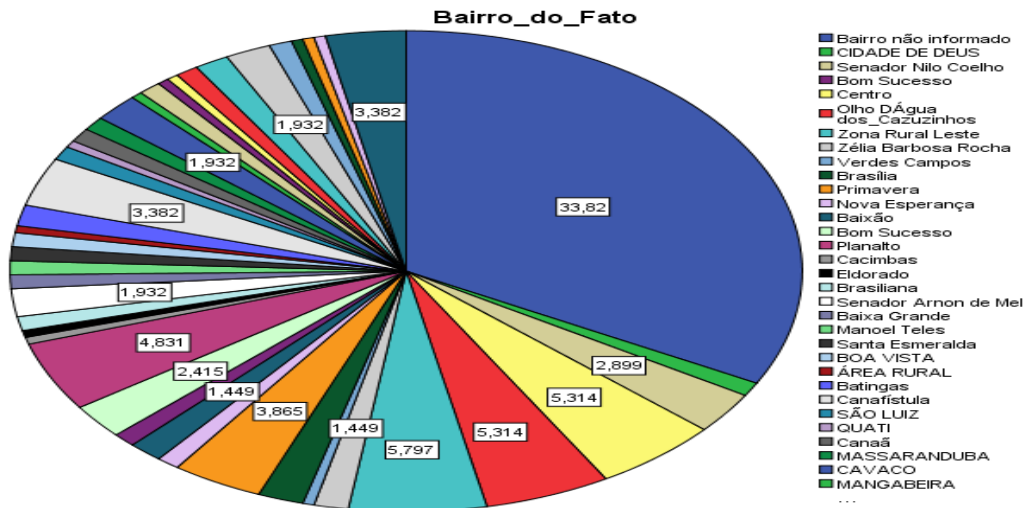
Table 1: In relation to gender, B.O. Police Report – by – Sex Crimes Committed Against Victims Age 0 to 12 - Period 2015 to 2021 (Jan to Sep)

		Sexo			
		Frequency	Percent	Valid Percent	Cumulative Percent
	Masculino	71	33,2	34,3	34,3
Valid	Feminino	136	63,6	65,7	100,0
	Total	207	96,7	100,0	
Missing	System	7	3,3		
	Total	214	100,0		

Source: Data Provided by the Civil Police, Resposta_Assteac_Sic_1673-2021.

In the data revealed that in the period from 2015 to 2021, the crimes committed against victims from 0 to 12 years of age, the majority of child victims are female 65.7%, with boys with 34.3%, in the Valid Percent, which calculates the number of times each answer is given in every 100 valid answers, that is, excluding non-responses. (Table 1).

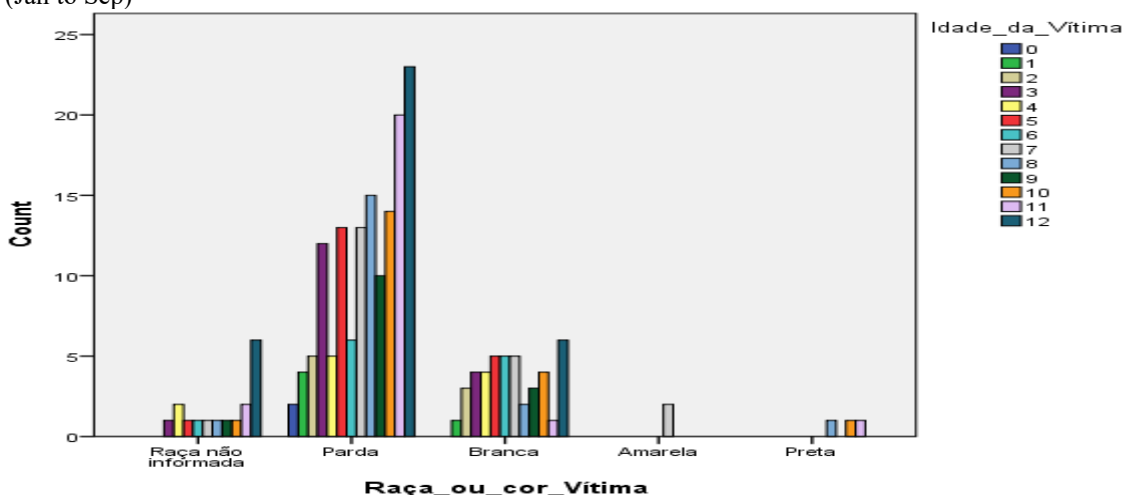
Graph 2: From the neighborhood of Fato, B. O. Boletim de Polícia - Crimes Committed Against Victims Age 0 to 12.



Source: Data from 2015 to 2021 (Jan to Sep), provided by the Civil Police, esposta_Asstac_Sic_1673-2021

Graph 2 above shows the neighborhoods that have the highest occurrences against victims of child violence, being children between 0 and 12 years old, Neighborhood not informed, with frequency of 70, percentage 32.7%, the occurrence of rape of vulnerable in Neighborhood not informed¹², 35; Plateau 7; Rural area 05; Centro, Primavera and Olho d'água dos Cajuzinhos 04; Bom Sucesso 03; Alto do Cruzeiro, Manoel Teles, Canaã, Canafístula, Batingas and Senador Nilo Coelho 02. And finally Cidade de Deus, Zélia Barbosa, Brasília, Baixão, Brasiliana, Senador Arnon de Melo, Baixa Grande, Boa Vista, Rural area, São Luiz, Quati, Massaranduba and Cavaco, Fazenda Venha, Ouro Preto and Novo Horizonte 01.

Graph 3: Of the Ages of the Victims, B. O. Police Report - Crimes Committed Against Victims Age 0 to 12 - Period 2015 to 2021 (Jan to Sep)



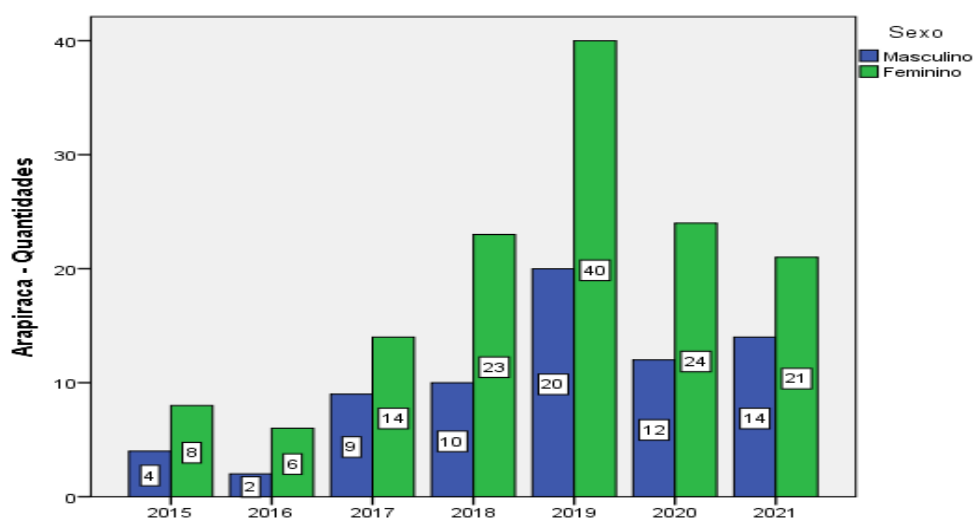
Source: Data Provided by the Civil Police, Resposta_Asstac_Sic_1673-2021

¹² For security agents, there is a presumption that this spatial category refers to rural areas, borders between them, or even occupation in urban settlements.

In ethnicity, the skin color was the most frequent among victims aged 0 to 12 years, brown in first place with 142, in second place white children with 43, and third not informed with 17, black color with 03, and finally yellow color with 02, graph 3. In the occurrences against victims from 0 to 12 years old in relation to the age of the victim, in the age of 12 years there are 35 cases, 11 years - 24 cases, 07 years - 21 cases, 10 years - 20 cases, 05 and 08 years - 19 cases, 03 years - 17 cases, with a total of 133 complaints, people who have found a way to stop the violence. Still in relation to brown color, the ages in descending order were 9 years, 6, 4, 2, 1 and 0 up to 11 months, 52 cases, lowest occurrence rate, but 12 years, 11, 10, 8, 7, highest occurrence, above, graph 3.

In the aspect of the year of the fact, graph 4, from 0 to 12 years old, in 2015, there were boys with 04 cases, and girls with 08, so 66% more are girls. In 2016, 02 boys and 06 girls graduated, again girls were the majority. In relation to the sex and year of occurrence of these crimes against victims from 0 to 12 years old, it is noted that in 2019 there were 60 cases, the highest incidence between 2015 and 2021, while in 2020 there were 36 cases in the period of the covid 19 pandemic, where people stayed at home and carried out their work from home, In 2021, there were 35 cases recorded.

Graph 4: In the period 2015 to 2021, Jan to Sep, B. O. Boletim de Occorrencia - Crimes Committed Against Victims Age 0 to 12.



Source: Data Provided by the Civil Police, Resposta_Asstec_Sic_1673-2021

In the previous periods, in 2015 there were 12, 2016 there were 8, 2017 there were 23, 2018 there were 33 cases registered at the Civil Police Station of Arapiraca Alagoas, graph 4. One solution would be the daily practices developed by multidisciplinary teams of technicians from Municipal Secretariats, shelters or the Judiciary, when working within the Rights Guarantee System (Ferreira *et al* 2011).

Regarding 2017 boys were 09 cases, and girls 14 cases, 2018 boys were 10 cases, and girls 23 cases, while in 2019 boys were 20 cases and girls 40 cases. In 2020, the year of the covid-19

pandemic, there were 12 cases of boys and 24 cases of girls, in 2021, there were 14 boys, and 21 cases of girls or 60%, the crimes committed against children from 0 to 12 years old, victims of Arapiraca, graph 4.

Characterizing violence, in a certain way in Arapiraca, as a biopsychosocial phenomenon, initiated by the structural violence of community life, as it is understood by the policy of socioeconomic inequality, appropriation and expropriation of categories and oppression of groups in society, a culturally based violence derived from the violence of monetary power. It rises over the relations of hierarchies of racial, ethnic, family and age groups, the violence of delinquency that is presented in what the population considers to be a crime or against the law, being articulated, on the other hand, the violence of resistance that marks the relationship of people of oppressed, subjugated classes and/or subjugated groups and/or material conditions, Minayo and Assis, (1994) and regarding the problems of externalization and internalization the negative experiences in Goulart, Wagner, (2013).

WHEN THE FACT REACHES THE GUARDIANSHIP COUNCIL: A READING OF SPATIALITY

When families go to the Guardianship Council, what kind of assistance can they have? – counseling, recommendation and referrals, the simplest parents, who receive the Bolsa Família or the parents with greater financial power want to satisfy the prerogatives of Law No. 8.069/90, even though they do not know of its existence, in some cases, the Statute of the Child and Adolescent (ECA), Article 7 states that every child and adolescent has the right to protection of life and health [...]. The guardianship council is an autonomous entity that protects the rights of children and adolescents, and its attributions are those of Law No. 8,069/90, art. 136:

[...]. I - to assist children and adolescents in the hypotheses provided for in arts. 98 and 105, applying the measures provided for in article 101, I to VII; II - assist and advise parents or guardians, applying the measures provided for in article 129, I to VII; III - promote the execution of its decisions, and may: a) request public services in the areas of health, education, social services, social security, labor and security; b) to represent before the judicial authority in cases of unjustified non-compliance with its resolutions. IV - to forward to the Public Prosecutor's Office a report of a fact that constitutes an administrative infraction [...].

Looking at the data from the report of the Tutelary Council I and II, Report on Violations by Right Violated by Sex, or gender in a total of 1,544 attendances in 2022, 836 girls or 54.14% and 708 boys or 45.85%. In the Report on Rights Violated by Locality by Violating Agent, out of a total of 1,974, knowing that the violating agent may have violated more than one right, 652 mothers 33%; 415 father 21%; 193 educational institutions 10%; 102 grandparents 5.1%; 91 Own adolescent 4.6%; 89 Individuals 4.5%; 70 Uncle/Aunt 3.5%; 53 Social Assistance Entity/Organization 2.6%; 47



Educational institution 2.3%; 32 Second degree relatives 1.6%, and 25 Adolescents 1.2%, among others.

In the occurrences against the violating agent, the mothers received 33% of the complaints of violation of children's rights, or suspicion of aggression, so it is necessary to be cautious, even if the fact is irrefutable, the mothers are most of the time in the care/children. On the other hand, fathers have 12% less than mothers in complaints of suspected aggression, even though they are not fully present in the care of the infant, as a result of having to work to support the family, and being absent, they have prudence.

Regarding the Report of Violations by Right Violated by Color/Race, of the Tutelary Council, yellow 2, White 56, Indigenous 0, Not Informed 55, Black 19, Brown 88, with 64% of browns and blacks in relation to whites and yellows, of the 220 rights violated described below: Acts that violate citizenship, Discrimination, Denial of the right to freedom and respect, Restrictions on the right to come and go, Submission of children or adolescents to illegal activities or social misdemeanors, Physical Violence, Psychological Violence and Sexual Violence, Abuse - Commercial Sexual Exploitation.

In the data of the Bolsa Família of the Municipal Department of Social Development – SMDS, an analysis will be made between the 05 neighborhoods with the highest number of families with children who receive the aid of the Bolsa Família program in Arapiraca and the neighborhoods of the agents who violate the rights of the Guardianship Councils of Arapiraca, Table 2.

Table 2: The 05 largest neighborhoods that receive the Bolsa Família Program and have children, and the 14 that violate the rights of the Guardianship Councils of Arapiraca¹³.

Locality	Occurrences Recorded by the Guardianship Councils					Number of Bolsa Família beneficiaries with children in 2023
	2018	2019	2020	2022	2023	
Primavera	DNF ¹⁴	DNF	28	162	114	Olho D'água dos Cazuzinhos – 4711
Brisa do Lago, Vale da Perucaba = Olho d'água dos Cazuzinhos	DNF	DNF	70	136	143	Planalto – 3174
Senador Nilo Coelho	DNF	DNF	4	77	57	Canafistula – 2708
Manoel Teles	DNF	DNF	34	73	57	Bom Sucesso – 2437
Cacimbas	DNF	DNF	21	55	38	Spring – 2187
Zélia Barbosa Rocha	DNF	DNF	20	67	49	
lanalto	DNF	DNF	34	59	38	
Canafistula	45	17	25	46	52	
Brasília	DNF	DNF	00	33	16	
Baixa Grande	DNF	DNF	8	33	15	
Baixão	DNF	DNF	2	37	23	
Brasília	43	38	21	42	27	
Bom Sucesso	DNF	DNF	23	41	41	
Boa Vista	26	9	22	30	36	

Source: Data provided by the Guardianship Council and the Municipal Department of Social Development – SMDS.

In a total of 41 neighborhoods in Arapiraca, registered in the spreadsheet of the services of the Tutelary Councils I and II, from 2022 and 2023, there is a connection between the neighborhoods of the families registered in the bolsa familia program and the neighborhood of the agents who violate rights, where Olho D'Água dos Cazuzinhos¹⁵ 136/2022, 143/2023, 2nd in occurrences and has 4,711 families who receive the aid, as well as the 7th, 8th Canafistula, 13th Bom Sucesso and 1st Spring Plateau in occurrences. However, care should be taken with this information so as not to standardize families that violate the rights of infants and those that receive the Bolsa Família, although there is this tendency that the lack of employment causes conflicts, Table 2.

In 2020, there were 377 cases attended by the Tutelary Council of Region II, I will mention a few: 9.01% or 34 cases plateau, Canafistula with 6.7%, Bananeira 6.3%, Alto do Cruzeiro and Bom Sucesso 6.1%, Brasília 5.5%, Caititus 4.5% or 17 cases, Centro 4.2%, Agreste 4%, Quati and Senador Arnon de Mello 3.4%, converge with the data from Bolsa Família. In relation to 2019 of the 257, 2018, 2017, also Canafistula in 2018 with 45, Brasília 43, Caititus 35, Alto do Cruzeiro 29 and Boa Vista 26, of the 421. Over time, the neighborhoods with the highest number of occurrences change order as they receive visits from the guardianship council, with recommendations for the treatment of children and adolescents (Table 2).

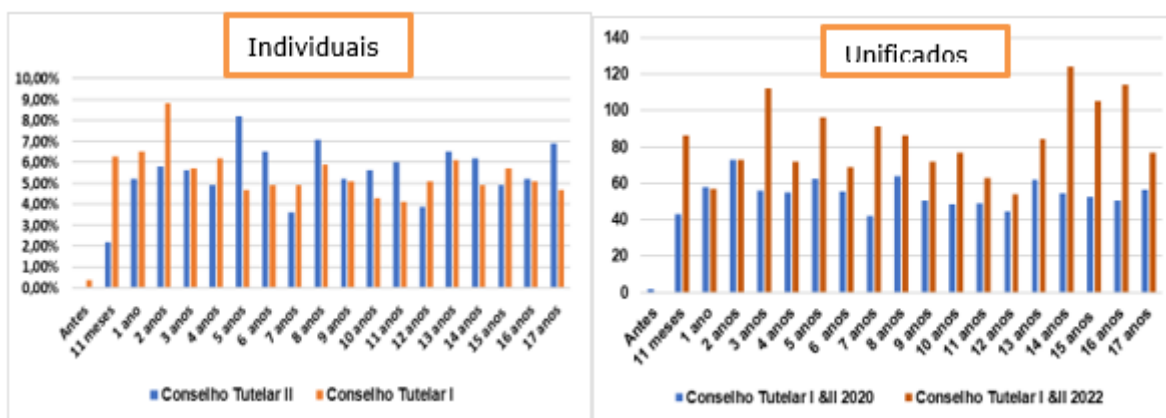
¹³ Data from 2018, 2019, 2020 and 2021 were not quantified with excellence due to the lack of computers and people trained to perform work on the computer.

¹⁴ Data not provided by the Tutelary Council of the most populous region I.

¹⁵ Brisa do Lago, Perucaba Valley.

The 524 attendances of children and adolescents, graph 5, individual data from the Tutelary Council I, from 2020, 70% girls 368, 28% boys and 0.38% pregnant women. Of the 524 children with the ages of those treated before birth, 0.38% were pregnant, up to 11 months were 6.3%, 1 years 6.5%, 2 years 8.8%, 3 years 5.7%, 4 years 6.2%, 5 years 4.7%, 6 years 4.9%, 7 years 4.9%, 8 years 5.9%, 9 years 5.1%, 12 years 5.1%; These children are mostly from 0 to 12 years old; 15 years. In 2020, the Tutelary Council II provided 461 cases, of which 224 were girls (48%), and 237 were boys (51%). The age of most victims is between 8 years old and 17 years old, 8 years old 7.1%; 9 years of 5.2%; 10 years of 5.6%, 11 years of 6.0%, 12 years of 3.9%, 13 years of 6.5%, 14 years of 6.2%, 15 years of 4.9%, 16 years of 5.2%, 17 years of 6.9% or 32, with a margin of error, because it is manual, the records.

Graph 5: The ages of the victims of Aggression of the Guardianship Councils I and II, individual, 2020 & Guardianship Councils I and II, unified 2020 and 2022.



Source: Data provided by the Tutelary Council I and II of Arapiraca.

In 2022, graph 5, in the Report Violated Rights by Age Group, after unifying the data from the guardianship council I and II; 985 cases in 2020, and in 2022 there were 1,512 cases with all ages, 1 to 11 months 86; 1 year 57; 2 years 73; 3 years 112; 4 years 72; 5 years 96; 6 years 69; 7 years 91; 8 years 86; 9 years 72; 10 years 77, 11 years 63; 12 years 54; 13 years 84; 14 years 124; 15 years 105, 16 years 114 and 17 years 77 cases, with 527 more /2020.

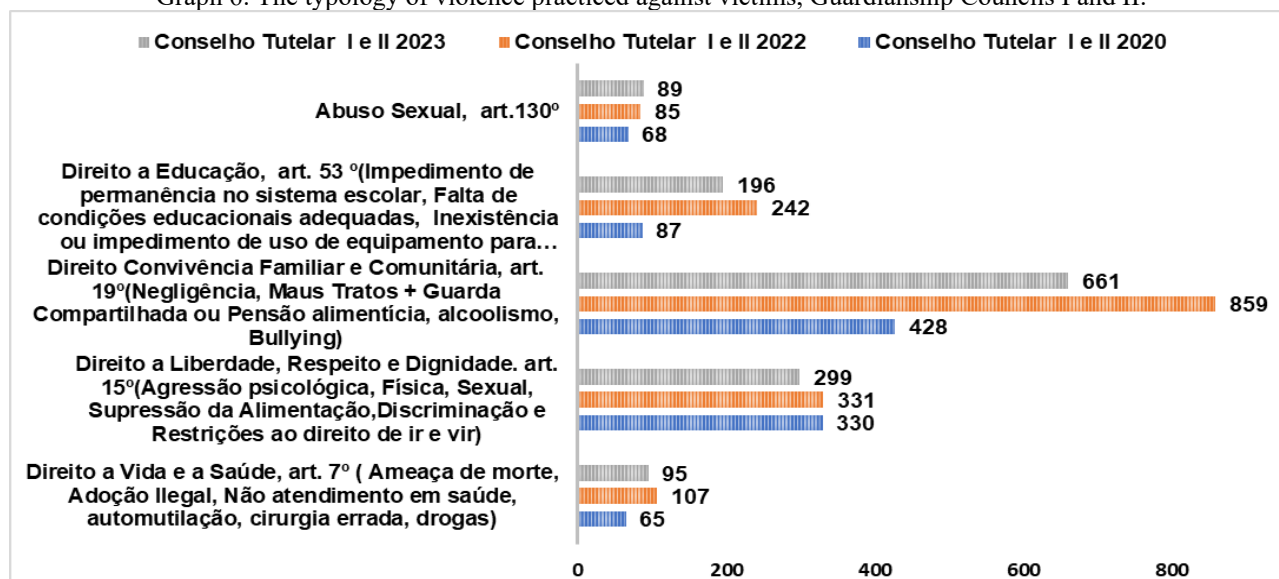
One of the biggest problems in the neighborhoods of the Tutelary Council I is the lack of daycare centers or public comprehensive schools, and that is why there are so many occurrences with children from 0 to 12 years old. Education, Vieira (2001; 2007), aims at the full growth of the human personality and the improvement of respect for human rights and fundamental freedoms; enriches understanding, benevolence/friendships; scientific publications and books in the area, according to Dr. José Luiz Setúbal, 2018, in positive languages to deal with children's and adolescents' behaviors.

On the website of Sopia, of the Tutelary Council I and II, Report of Rights Violated by Locality by Violating Agent, from 2023 until November 4, there were 1,101 complaints, in this sense the mother 389 or 35.33%, and the father 167 or 15.16%, Educational institution 139 or 12.62%,

Adolescent Own 66 or 5.9%, Individual 64 or 5.8%, Grandparents 46 or 4.1%, Stepfather 34 or 3% and Social Assistance Entity/Org. 28 or 2.5%, and others 16%.

In 2023, 75 girls 84%, 14 boys 15.73%, of 89 cases, of the 1,237 attendances from January 1 to October 24, 2023, were related to abuse, sexual violence, and 15.73% were 15.73% of the sexual violence. In Graph 5, 2022 index, 73 girls 85.88%, and 12 boys 14.11%, out of a total of 85 cases, were 1,544 victims of violence assisted in 2022. According to data from the Brazilian Yearbook of Public Security, children up to 13 years of age represent the majority of rape victims in Brazil, 61.3% of the total number of cases.

Graph 6: The typology of violence practiced against victims, Guardianship Councils I and II.



Source: Data provided by the Tutelary Council I and II, 2020, 2022 and 2023 and available at: Sipia<<https://sipiaconselhotutelar.mdh.gov.br/login>>, Consulted on: October 25, 2023, from Arapiraca.

When reading all these typologies, one wonders: To whom should one seek help? - Where to go, how and what to do? – the answer will always be to look for support networks, following the ECA. Negligence in 2020, 2022 and 2023 was a strong reason to go to the Guardianship Council, followed by education, psychological or physical aggression, life, health or drugs, and sexual abuse, but others were described below, graph 6. To those who chose the guardianship council in 2020, there were 590 cases, in the Guardianship Council I, Psychological Aggression 13.2%, Shared Custody 11.86%, Mistreatment 11.35%, Physical Aggression 10.8%, Education 10%, Negligence 8%, Alimony 7.4%, Drugs 7.2%, being the most populous neighborhoods within the report made manually. In the sphere of violence, there were 470 cases, 2020, in the Guardianship Council II, Negligence 22.12% or 104 cases, Mistreatment and/or Physical Aggression 17.66%, Sexual and Child Adolescent Abuse and Verbal Aggression 9.36% or 44 in both, Abandonment of the Incapacitated and Psychological Aggression 7.2% in both, in Education 5.95%, Drugs 4.8%, Health and Birth Certificate with 3.61% or 17 cases, and others, graph 6.



Right to dignity, C. F. of 1988, art.227 and of Law 8.069/90 art. 18, which is everyone's duty to watch over the dignity of infants. It is important to avoid comparing one child to another, as comparing continuously will make their anxiety and stress levels higher, seen in research that it adversely affects a child's confidence and sense of self, Akhila (2019). The violator of the rights of minors, 2020 of the Tutelary Council II, Municipal Law No. 2741/11, of alleged aggressors, 181 people, in Arapiraca-AL, 33% are from the father - 60, 31% are from the mother - 57, and, 7% are from stepmothers and stepfathers and the remaining 28% or 52 are from uncle, grandmother, neighbor, own child and at school, daycare or health. According to 2020 data from the Guardianship Council I, Municipal Law No. 3,351/19, there were 302 alleged aggressors of minors, 121 mothers 40%; 82 parents 27%; 40 own children and adolescents 13.2%; 12 education 4%, 2.7% the paternal grandmother, and others. Complaints made by the disk 100, a total of 162, in the two guardianship councils.

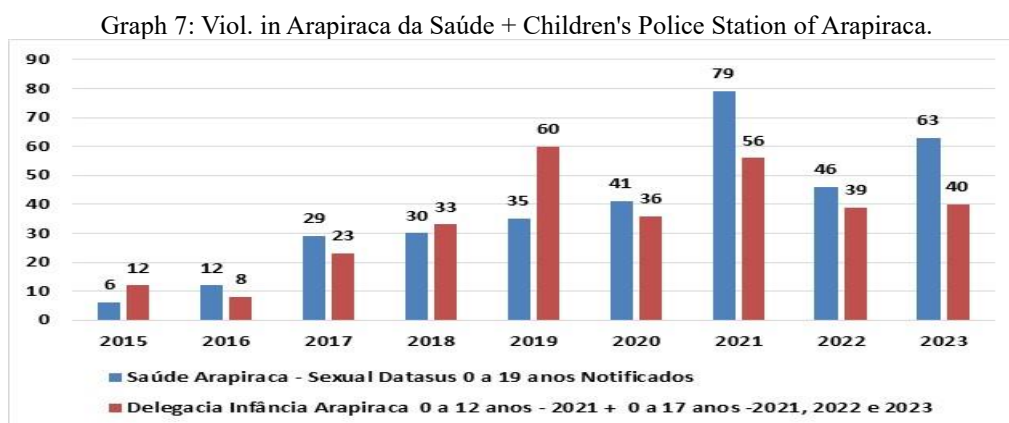
One of the paths that victims should follow in cases of mistreatment or neglect of children should go to the Guardianship Councils of their neighborhood, or to the UPA, Hospital, Basic Health Unit, or to the Civil and Military Police and the Public Prosecutor's Office and/or through the *national hotline "Dial 100"* services ; inform the facts on the call, to assist in the intervention of the public authorities. One solution to deal with domestic violence would be to implement programs aimed at educating parents against violence in childhood, Professor Maria Beatriz Linhares, from the Faculty of Medicine of Ribeirão Preto, São Paulo, FMRP-USP, and coordinator of the study on child violence in Brazil, in an interview:

"Violence against children in the family environment has a negative short-, medium- and long-term impact on the physical and mental health of victims and can lead to an intergenerational cycle of violence – when the victim of childhood violence repeats with their children the abuse they experienced," (28 March 2023, Thais Carrança Role, BBC News Brazil in São Paulo).

Considering this disparity in the length of care, a possible solution would be to implement programs aimed at training parents against violence in childhood and to combat the parallel dimensions of violence such as material poverty, unemployment and the domestic burden of women in the family environment. In the 4th, the Right to Education, provided for in C. F.de 1988, art.227 and Law 8.069/90 regarding the right to education and the duty of the State, the family, the community, art. 54 it is the duty of the State to ensure that children and adolescents receive free and compulsory basic education; Article 56 The directors of elementary schools shall report to the Guardianship Council cases of mistreatment involving their students.

WHEN THE OCCURRENCE REACHES THE ARAPIRACA HEALTH SYSTEM

In the data in graph 7, from the Health of the Municipality of Arapiraca-AL, by the Datasus website¹⁶, on Interpersonal/Self-Inflicted Violence, 0 to 19 years old, in hospitals and health centers, with March, April, August, September and October, months of highest incidence. In Eler (2019), article 11 provides that "Full access to lines of care aimed at child and adolescent health, Unified Health System, is ensured".



Source: Data provided by the Municipal Health Department of Arapiraca/AL from the <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sinannet/cnv/violeal.def> and <https://e-sic.al.gov.br/login/system> Retrieved on: October 30, 2021 and 2023.

In the 2020 Arapiraca Health datasus, from 0 to 19 years old, there were 41 sexual violations, out of a total of 464, and 2021 with 79 sexual, while in 2019 there were 35 sexual, out of 502 other forms of violence by age. In 2020 in the data of the Children's Police Station from 0 to 12 years old, where in 2019 there were 60 cases of B.O. of child violence, 2020 with 36 cases, 2021 with 56 cases, with a reduction in 2022 with 39 cases, and 40 in 2023, with the move of the Children's Police Station to a more distant neighborhood, It may have a further reduction in 2024. Studies by (Goulart, *et al.* 2013) indicate that marital conflict should impair the psychological (Davies & Cummings, 1994), social (Grych & Fincham, 1990) and academic progress (Harold, Aitken, & Shelton, 2007) of infants. In relation to ethnicity or color, on the Datasus website, ignored 21, white 74, Black 13, yellow 1, brown 631, Indigenous 1, Total 741.

CONCLUSION

The research was guided by law 8.069/1990, ECA, and its development was supported by the child protection networks and the State University of Alagoas-UNEAL. The results presented in the study regarding ethnicity, with the majority being brown 1st, and white 2nd most frequent in the

¹⁶In the Tabnet and Epidemiological and morbidity segments, the following option Interpersonal Violence, Frequency of Sexual Violation; according to the Municipality of notification; age group <1 Year, 1-4, 5-9, 10-14, 15-19, with and without notification, ignored or blank. Period: 2022, 2021, 2020, 2019, 2018, 2017, 2016, 2015.



Police Station, in the health area and in the Guardianship Council. Regarding the role of the State, the fragility of public policies in connecting the intervening agencies, the lack of daycare centers or public full-time schools in the neighborhoods of the Tutelary Council I, are presented as possible causes of the greater number of occurrences of violence against children and adolescents from 0 to 12 years old. Another point identified in the study was the lack of integrated systems between the entities, Sopia or Datasus.

The care with those who take care of the child was highlighted, so that this child is more assured in their rights to be happy, although employability and non-dependence on the family allowance showed that there was less incidence of violence. The objective of the study was to raise awareness and educate about the motivations, which depended on the type of crime, or the violence, so the family member would go to the 1st Guardianship Council, the 2nd Health, the 3rd Police Station, and/or other entities of the support network of Arapiraca/AL. In this sense, it was possible to quantify statistical data from the support networks, which resulted in possible directions: in the case of violence, it was the health area, then the Guardianship Council for negligence in care, and putting an end to the police station in the event of serious crimes or repetition of the fact.

The focus of the problem is to maintain actions between the entities for the best interest of the child, in Law No. 8,069/1990, knowing that intrafamily violence against children is recurrent in Arapiraca. In the databases consulted, the mother had the highest number of complaints for negligence in the guardianship councils, followed by the father for violence, the same result in the Police Station and in the health department.

It is congruent to bring together a possible solution to deal with intra-family violence, which would be to implement programs aimed at training parents against violence in childhood, provided by entities that support minors, such as the Guardianship Council, the Department of Health, Social Assistance, the Police Station, the Public Defender's Office, the Public Prosecutor's Office, the Children's Court and the University itself – Uneal. Praising the fight against intra-family violence in Arapiraca, in addition to combating the parallel dimensions of this violence.

ACKNOWLEDGMENT

To Uneal for the financing of the extension project and to the entire child & adolescent support network in the municipality of Arapiraca-AL.

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Body awareness, body image and corporeality in Physical Education: A literature review

 <https://doi.org/10.56238/sevened2024.014-019>

Claudiney André Leite Pereira¹

ABSTRACT

Our objective with this study will be to reflect based on a literature review on how the concepts of body awareness, body image and corporeality are present in Physical Education. Although the view on the human body has been greatly expanded in recent decades, Physical Education professionals are still seen by society as responsible for the body's performance, that is, those who have the ability, through exercises, to tone their muscles and to make bodies healthier, given this it is necessary to know the values of the consumer society present in these relationships.

Keywords: Physical Education, Body, Corporal conscience, Image, Corpolatry.

¹ Master in Human Development - FVC
Degree in Physical Education - UFBA.
Professor at the Federal Institute of Bahia – IFBA.



INTRODUCTION

Studying the body throughout history, we realize how much it has been hostage to ideologies built in the confrontations that involved: culture, religion, politics and various power relations that we can find in society.

Plato in Ancient Greece already signaled about a policy for the body, because he believed that in this way we could form an organized society, in our days, the increasing search for a body aesthetics to meet the desires of the modern world has led people to often resort to the use of chemical substances, unaccompanied diets and unnecessary surgeries, often having harmful consequences, not only physical but also psychic. Within this new order of corporeality, Physical Education professionals are perhaps one of the most requested to adapt bodies to the standards of the moment, seeking through exercise programs, to make them lean and strong.

Gyms represent "the stage" where we watch these spectacles of cult of the body, of the search for the beautiful body, people who in the name of "health" seek to bring their bodies closer to the aesthetic standard of the moment.

It is within this framework that we perceive the importance of the Physical Education teacher as a professional who can contribute to the individual in the search for a better understanding of the influence of these social determinants on his body.

By body consciousness we mean something much greater than the simple synesthetic perception of the body in space, but rather a state of reflection in which the individual perceives that his body is the result of a whole social context.

In order to support these discussions on the subject, we will study the symbolic construction of the body throughout history and the influences suffered by it within a model of capitalist society.

The search for an aesthetic body within contemporary standards and the seduction of man-made consumer goods has led people to a stage of constant dissatisfaction where through changes in their bodies whether with exercises, clothes, tattoos or body modification techniques² they seek their identities within society.

Plato, when he said music for the soul and gymnastics for the body, seems to make clear the importance of a special look at the body, and the importance of physical exercises in its formation. Through physical activity, man would shape his body that would mean beauty, health, harmony. Plato believed so much that we could build a perfect society through the education of the body that for each citizen should perform a certain activity in the city for a lifetime.³ In the city idealized by Plato, there were those who, because they possessed an inferior nature or a soul of *iron or bronze*, with a coarse and weak sensibility, dedicated themselves to manual activities such as agriculture, handicrafts

² For Nolasco (2006, p.376) it is the understanding of body modification practices, understanding them as mutilatory actions in the name of some traditions, or even as pathologies of the subject.

³ The Republic.

and commerce. Those with silver souls possessing courage will be the warriors or guardians responsible for the custody of the city. Those with *a golden soul* will be the best and most outstanding of the guardians, who will be selected and instructed in the art of philosophy; their function was to govern the city.

Today we perceive a selection and a race in the search for a body that best suits what is linked by the media. Edvaldo Couto (2000, p. 246) states that

"Through this seductive effort of updating, the body comes to be seen as an open object, subject to many mystical and technological influences. People want at all costs to be young, beautiful and strong. Guarantees are sought, even if circumstantial and ephemeral, that ward off physical or mental wear and tear, compromising the good form that one aspires to."

The concern with the body in the path of civilized man was not limited to aesthetic issues, since religious values and domination were also present. As Merleau Ponty (2006, p.122) said, "The body is the vehicle of being in the world". Jacques Gelis (2008, p. 19) points out this issue well

"Because it is at the center of the Christian mystery, the body is a permanent reference for Christians of modern centuries. Was not his Son sent to earth by the annunciation-incarnation, which God gave to humans a chance to be saved, body and soul?"

The body of Christ is at the center of the Christian message, he died to save us, his body bleeds on the cross represents the deepest act of his love for his fellow human beings. 2008, p. 23).

In the Middle Ages, the body was seen with a paradoxical gaze: "On the one hand, Christianity does not cease to repress it... on the other hand, he is glorified, above all through the suffering body of Christ, sacralized in the church, the mystical body of Christ" (LE GOFF, 2003, p.35). The Middle Ages are known as the dark ages, where under the domination of the church various bodily practices were reproached such as sports, and behaviors related to sexuality were repressed, the purification of the body resulted in its abstinence from carnal pleasures and its suffering represents the approach to the body of Christ and salvation before the Lord.

Perhaps the Middle Ages are the birthplace of the body as an emblematic and representative element of socially determined historical values. Blood is another element of the body that had a peculiar reading of the dictates of the Catholic Church

"Christ is a contradiction and paradox, since Christian practice is founded on the sacrifice of a holy but bloody victim. For the rest, the Eucharist unceasingly makes this sacrifice: "This is my body, this is my blood," Jesus says to his disciples during the supper. (LE GOFF, 2003, p. 39).

Even in relation to sexuality, the Middle Ages defined the roles of men and women in the movement of their bodies during the sexual act: "In bed, the woman must be passive, the man, active, but moderately, without rapture" (Idem, 2003 p. 41) The woman's body is placed in a position of



inferiority in relation to the man, It is up to the latter to command the actions during the sexual act, the body consciousness perceived by the woman becomes that of submission, giving pleasure to the man is her function, as well as being more beautiful and attractive to the opposite sex.

In our modern society, no matter how much financial independence women have achieved, they still feel the importance of having a man by their side.

"The search for a loving and sexual partner suffers from the effects that are inaugurated by the relationship with the father. Perhaps we could think that a woman, in a certain way, demands much more from the love relationship and, at the same time, in a very diffuse way than men" (CALLIGARES, 2006, p. 18).

In the capitalist world, the body has more than ever attained a prominent position. While Plato sought the integral individual through physical culture and intellectual development, we are witnessing in our days a parade of bodies increasingly distant from what we can consider respect for individualities. People seeking more and more to look like others, fashions and defined behaviors leading people to maintain a consumption pattern.

In fact, in a society in which the body has become as important an entity as the soul once was, it is by physical appearance, above all, that what each one wants to show of his subjectivity is proved. And when the work of modifying one's appearance can erase the reality of age and social origins, it becomes difficult to resist the proposals of cosmetics and plastic surgery." (Sant Anna, 2004, p.19).

In the twentieth century, with the affirmation of capitalist culture, the body becomes of fundamental importance in this process, through the imposition of beauty standards, in the need to increase consumption the media offers us a series of possibilities to change our body image.

"The culture industry, which explores behavioral trends, could not leave aside the vein of body care. Behavioral magazines, especially women's, since their beginnings have brought beauty tips such as skin and hair care, gym sessions, in a discourse that seeks to convince by mixing aesthetic and technical arguments: to become beautiful and attractive and/or to maintain a healthy life and feel good." (CASTRO 2007, p. 47).

Castro, in his book **Cult of the Body and Society**, makes a study with the magazines *Boa Forma* and *Corpo a Corpo* (Body to Body), of great circulation in our country, where she found all the construction of a discourse of cult of the body by these publications. "It seems that the cult of the body arrived in the early 1980s to stay and the media, as an efficient catalyst for behavioral trends, quickly assimilated it" (CASTRO, 2007, p. 64).

The constructions of body models to be followed have much deeper implications that are not observed only by the critique of consumption. They are human beings who follow patterns of behavior, seek their bodies in other bodies and thus lose over time the main element that makes them unique in the world, that is, their individuality. We identify ourselves from what we are and not from



what the other wants me to be, "The body is the vehicle of being in the world, and to have a body is, for a living being, to join a defined environment, to be confused with certain objects and to be continuously committed to them" (PONTY, 2006, p. 122). Our relationship with the world is through our body, if we are going to look for images in other bodies to identify ourselves, it will not be us who exists, but a product of a hybrid relationship with the desired body.

"From the denunciation of the alienated body, one migrates to the revelation of an obsolete body. To transform it, to increase its performance levels, to adapt it to the use of new technologies is thus proportional to the common dream in the 1960s of removing it from alienation, making it truer and freer. As if today it were necessary to attune the bodies to the technological and consumer objects, whereas, for countless ancient societies, it was necessary to attune the body to the cosmos or supernatural forces. However, even considering that these experiences are challenging in the face of the top-modeling of appearances, which includes the dictatorship of smooth skin and the body without mysteries, one sometimes gets the impression that they do not completely escape the global expansion of photogenic totalitarianism. (Sant Anna, 2004, p. 21)

Faced with these questions, people build their perceptions about their own body, which is that of the aesthetic world of appearances, of immediacy, which leads us to media mimicry where we are happy with the body of fashion and making us bearers of a naïve consciousness. For Merleau, Ponty (2006, p. 193).

"Consciousness is the being for the thing through the body. A movement is learned when the body has understood it, that is, when it has incorporated it into its "world," and to move its body is to aim at things through it, it is to let it respond to its request, which is exerted upon it without any representation.

To be aware of the body is to realize that the hegemonic values present in society end up influencing the perception we have about our own body. From Merleau Ponty's understanding of consciousness, it is the key to perceiving the world through our body. If we understand the relationships present in the world about our body, whether we can incorporate them or not, the important thing is to have a critical sense about them.

This discussion becomes important for Physical Education as we realize that any anxiety, dissatisfaction with the body in relation to its silhouette, society sees in the Physical Education teacher one of the professionals responsible for this transformation.

CONCEPTUALIZING: BODY AWARENESS, BODY IMAGE, AND CORPOREALITY.

BODY AWARENESS

The concept of body awareness that we will take as a reference in our study is that of Professor Lini Castellani (1988, p.22)

"Man's body awareness is his understanding of the signs tattooed on his body by the socio-cultural aspects of certain historical moments. It is to make them aware that their body will

always be expressing the hegemonic discourse of an epoch and that the understanding of the meaning of these "discourses", as well as their determinants, is the condition for them to participate in the process of construction of their time and, consequently, in the elaboration of the signs to be engraved on their body"

As already noted in the introduction to this text, the view of the body throughout history has always been a key element of ideologies that had as their main objective the control of the body. These control mechanisms are also observed in our days, when we witness an appreciation of the individual from his bodily aesthetics to a search for beauty, as Ferreira and Sampaio (2009, p. 123) point out

"Beauty would be equivalent to the lowest possible percentage of body fat, large and perky buttocks and breasts, defined muscles, tanned skin, thick lips, absence of cellulite, stretch marks, any blemish or pimple on the skin..."

From the perspective of Professor Lino Castellani, these body aesthetic elements are the result of a consumer society in which it needs to produce dreams and desires at all times so that people buy the body of their dreams in pharmacies, gyms, beauty centers, etc.

Other authors seek to understand the "being" in the world through the study of consciousness, which also brings important elements to this discussion for

"Consciousness is made available to us by nature as a latent faculty in our being, but for it to manifest itself it is necessary to awaken it and to awaken it we need to develop our qualities, for example: feeling, thinking, recognizing, daring and reasoning, through the relationships we establish on a daily basis, whether with people, beings, thoughts and/or feelings". (BARRETO, 2002, p. 04).

Consciousness would then be something innate to the human being, but cloistered, that is, we are born with it, but we need the relationships that are produced in our days with our feelings and with others. To analyze body consciousness within this perspective is to understand that the body is endowed with consciousness and that by reaching it in its fullness, the individual will be able to better define and understand his life. Merleau, Ponty (2006, p.193)

"Consciousness is the being for the thing through the body. A movement is learned when the body has understood it, that is to say, when it has incorporated it into its "world" and to move its body is to aim at things through it, it is to let it respond to its request, which is exercised on it without any representation.

To be aware is to realize the real importance of things for us, the body serves as a link in this interaction with the world, body awareness so it would be the understanding that our body apprehends what is necessary for its life, I perceive what has meaning within my context. Giovanina (2004, p. 74)

It says that

"All knowledge—including that of oneself—passes through the body. It is the body that is involved in the process of understanding, remembering, individuating itself. The body bears the marks of its history; We dream of bodies, we project bodies, archetypes manifest as bodies."

Every understanding we have of the world goes through the historical process of our body, and it is in this relationship with the world that we produce our dreams and desires, as already mentioned.

Being aware of our body in the world and making us understand when we are acting according to social conditions, when we are acting according to our individuality is this transition that becomes complex.

In the search for this understanding, we will discuss other categories such as: body image and corporeality.

BODY IMAGE

The discourses of appearances and images of our body are very present in our days, taking care of the look, making a good first impression - otherwise you won't have the second chance - are challenges of the modern world. We are judged by what we look like, in a first job interview, at work, in a love conquest, on the streets, etc. We are always concerned about our external image.

It is through external appearances that we relate to the world and create our reality. It doesn't matter who I am, it's what people think of me. Nasio (2008, p.21) says that these concerns occur very early in our lives

"When the child realizes that the image he gives to others is his image in the mirror, and that this image is not him, that others only have access to him because of what he has to do with it, he privileges appearances and neglects his internal sensations."

According to the author, the first embryos of narcissism begin to be implanted in the child, when he realizes that his contact with the outside world is through his appearance and not through his internal and true feelings.

Some concepts of body image can be extracted from the literature for Russo (2005, p. 80) "Body image is the body way in which the body presents itself to itself" further on he says that "the body industry through the media is in charge of creating desires and reinforcing images, standardizing the body" (Idem, 2005p. 80) In other words, the image we have on our body is greatly influenced by the discourse of consumption produced by the media, where we look for an image that best resembles the model of the moment. Within this modern mimicry of the body, we are always trying to adapt our image to the standard of the moment. tag.



We are represented in the world through our body and at all times for Barros (2005, p. 551) "we construct and destroy our body image. It's a succession of attempts to search for an ideal image and bodies." That is, all the time we are wanting to build new images for our body, maybe that's why there are days when we think we're beautiful, while others if we could we wouldn't look in the mirror.

This issue of body image is quite complex, and another point of view would be the one presented by Nasio (2008, p.98), "we do not choose what we are; we are what our bodily signifiers want us to be; We are alienated from a striking feature of our physique and we can do nothing about it!", we are marked by the physical traits that our body exposes us to society.

We seek a bodily perfection established by the beauty industry and the further we stray from it, we are punished for having traits that diverge from this standard. I become a part of my body as a representation, precisely the one that delivers me to the dock of the "gods of Olympus" of grace and beauty. He calls me that chubby, that short, all my body representation is found in some features of my silhouette, Nasio (2008, p.99) also says that body image is grouped into three states of the fantasized body

"The body felt, seen and signified. The felt body is the real body, whether it is sensible, desiring or joyful; the body seen is the visible body in its global form, reflected in the mirror, projected on a screen or perceived in my fellow man; and, finally, the signifying body is the symbolized body, itself a symbol and, above all, an agent of change in the reality of the subject. (emphasis added),

In the understanding of these three images, we think it is better to transcribe the author's explanation, which seems to us to be quite enlightening as to its concept.

"The image of the felt body is an unconscious mental image (proto-image) that can either remain unconscious, or becomes conscious, or even externalize itself in an action (image – action). It is an image pierced by the libido and as fragmentary as the body riddled with sensations, desires and jouissance, it is the double. The image of the body seen, that is, the specular image, is the image of our silhouette; an image as bumpy by the libido as the mental image of sensations. As for the image of the signifying body, it is neither unconscious, nor conscious, nor motor, but nominative, the name being the double d physical particularity that singularizes a given body." (Idem, 2008, p. 99, emphasis added)

CORPOREALITY

Etymologically, the word corporeity is the literal translation of the Latin term *corporalitas*, which, in turn, derives from *corpus – oris*. The critical dictionary of physical education provides us with a very broad definition of corporeality

"Corporeality, in a broad definition, is an abstract idea of the body, of corporeal being. This sense is inherited from Greek thought, expressed in the concept of *soma* or *somatic*. To the Greeks *soma* designates that which is material, especially in man, as opposed to the *psyche* or *psychic*. Latin and Christian cultures reinforce this meaning by understanding *corporalitas* as that which is of a material nature or, simply, materiality, radically opposed to spirituality. In this sense, therefore, corporeity concerns all that is material, because every material being manifests itself as a body." (SANTIN, 2005, p. 103).



The understanding of the body can be done from different perspectives, be they biological, physiological, social, anthropological, cultural, etc. The body is a true compendium that dialogues with various sciences.

The body of modern man is the target of detailed studies in our society that has as a form of economic survival the relationship: production – consumption – production, within this cycle that begins with work there are already several researches that seek to find ways to increase the productive power of the worker without injuring him such as: ergonomics, quality of life at work, studies on stress.

In consumption, body models and lifestyles are the main targets of product marketing. Car and appliance sales are always associated with sexy women and happy families, respectively. Images are produced all the time, suggesting to us a behavior of our body. The body is the link in this production chain; In order for there to be consumption, there has to be the desire to have what is offered to me.

To understand corporeality in our modern world is to reflect on the paths to which this society will lead us. For Gionanina Freitas (2004, p.57)

"Corporeity implies, therefore, the insertion of a human body into a world of meaning, the dialectical relationship of the body with itself, with other expressive bodies and with the objects of its world."

To reflect the body in the world is also to consider the ideologies present in society. The body expresses what society imposes on it, it ends up giving meaning to its actions based on pre-established values.

"The verb conjugated by capitalism is "I have" (the corollary, of which, in general, is "He has more than I have."). From "I have things," we went to "I have people" (wife, husband, children...) to "I have a body," which is actually a paradox, because it means to say, "I have me." Perhaps this verb is not specific to capitalism and corresponds to a human tendency to accumulate things and treat people as things" (Idem, 2004 p.)

Merleau Ponty said that we do not have a body but we are a body, we are in the world and we relate to it through our body, to realize the importance of this relationship is to understand that we are endowed with particular desires and feelings that make us: to be unique in the world, my essence is the basic unit of my individuality. If I look for my body in other bodies, I cease to be myself and start living as someone else who is not me or my desired body, it would be a representation of a new body with so many other bodies, similar bodies, then a paradox is established.

Nolasco (2006, p. 378) in his article: Body Modification (BM): The body and the experience of the self in the contemporary. It brings important elements to the understanding of corporeality in the modern world

"BM can be considered as subjective attempts to solve the problem of living in a world without a body, or in which the nature of the body has been replaced by the machine... The subject, by modifying his body, seeks to rescue himself in a place where the experience of himself is still indeterminate. An impossibility for today's societies, in which everything is determined and defined only as an economy, or as a market."

In the capitalist world, individualities are not respected, but rather the standardization of bodies to better select them within the sphere of consumption. As stated by Prof. Edvaldo Couto (2007, p. 52) "The body as an object of consumption, in hedonistic and psychological cultures, survives from the promotion of personal development, well-being, eternal youth, in futile and frivolous forms". Still on this issue of the ills produced by capitalist society in the understanding of our corporeality, Professor Maria Augusta Gonçalves (1994, p.28) says that.

"The dependence that contemporary man lives in relation to many products of modern technology has accentuated the poverty of experiences in which he participates immediately, as a bodily and driving being. The powerful media industry, while bringing man innumerable possibilities for acquiring knowledge and new perspectives, distances him from immediate sensible experiences with the world around him.

BODY AWARENESS AND PHYSICAL EDUCATION

Physical Education, as an important activity for the formation of the body, may have taken its first steps in ancient Greece with Plato.

During the periods of the great world wars, Physical Education began to have as its main objective the preparation of man for military service. In order to prepare him for combat, various methods were developed with this perspective, such as Swedish, German and French. In schools, the boys were already prepared for military confrontations.

With the revival of the Olympic Games (1896), the body is seen in Physical Education as an element that can unite peoples through sport. According to Oliveira (1983, p.44), Baron de Coubertin, "inspired by the English, intended to place sport as an element of Physical Education. After introducing sport into the French educational system, he set out on his great mission, this one at the international level: to restore the Olympic Games."

Physical Education in the twentieth century, especially in schools, began to adhere to the phenomenon of sportsmanship, where the Brazilian dream of winning a soccer World Cup and being an Olympic power began to be pursued by its rulers.

In society, the practice of sports is viewed favorably by all, as an excellent means for the promotion of health and leisure, and for the private sectors as a form of consumption, as Professor Valter Bracht (1997, p.87) observes.

"We can grasp the transformation that has been taking place in terms of the body culture of movement, including sport, especially in the last three decades, with the concept of commercialization/commodification or commodification of sport. And we are not referring



here only to the commodification process in the context of high-performance sports or spectacle, which is quite evident. We are referring to the penetration of the logic of the market in the scope of physical activities – leisure sports, carried out (consumed) by increasingly broad layers of the population".

Thus, the awareness of the strong and agile body is built in society from the practice of sports and health as the responsibility of the individual, that is, practice sports and have a dynamic and healthy body.

Around the 1930s, new demands on the body began to emerge in the world of work, not only physical strength, that is, this is no longer so important, but intellectual capacity, which according to Junior (2009, p.113) "From the 1930s onwards, there began to be a change in the Taylorist way of emphasizing the body as the main point of discipline with the emergence of studies and concerns with the issue of mental work."

In the 1970s, Dr. Kennedy Cooper's studies on the importance of aerobic physical activity for health began to gain great popularity on the benefits of cyclical exercise for the heart.

Physical Education in this new context ceases to be that area of knowledge that deals with the body only to prepare it for war or work and gains new epistemological possibilities. As Moreira (1995, p.101) proposes,

"The body – object of Physical Education gives way to the body subject of Motor Education; the mechanical act in the bodily work of Physical Education gives way to the act of conscious corporeity of Motor Education; the frantic search for the performance of Physical Education gives way to the pleasurable and playful practice of Motor Education; the elitist participation that reduces the number of people involved in the sports activities of Physical Education gives way to a participatory sport with a large number of human beings celebrating and communicating in Motor Education; the standardized and unison rhythm of the practice of physical activities in Physical Education gives way to respect for the rhythm performed by the participants of Motor Education".

We observed that new perspectives are pointed out for Physical Education, in other approaches we will also find different views in the treatment of the body in their respective practices.

Some understand Physical Education as a science that aims to encourage exercise practices in the promotion of health and perceive body awareness, but as a synesthetic view of the body in space, where we must observe our posture so as not to compromise the musculoskeletal system.

Professor Dartagnan Pinto Guedes, in his book *Physical Exercise in Health Promotion*, understands that there are some physical valences that, when worked, can make a good contribution to the maintenance of health, such as: cardiovascular capacity, strength, muscular endurance and flexibility.

"Health-related physical fitness is defined as those components that are directly related to the same health status and, additionally, demonstrate positive adaptations to regular physical activity and physical exercise programs." (GUEDES, 1995, p.19)

The body in the twenty-first century has found in the most diverse sciences studies in which they aim to understand its "or alienation", thus placing it at the center of several debates: body, culture, body, health, aesthetic body, body, consumption, body, work, body, religion, etc., and the studies of body consciousness follow this logic in a certain way. Another theorist who also brings his contribution to this issue of body awareness is Professor Regis de Morais (2003, p.74) who understands that body awareness begins in movements.

"In the skillful movements of dancers and sportsmen, we have the first perception of bodily resources in terms of a multi-direction of action and a subtlety of expressions that evidence, in the body, a structuring and a dynamic endowed with almost unlimited capacities. The wisdom of the bony joints and muscular dispositions makes us find an intelligence that characterizes every small or large part of the body that we study; Speaking only of macroscopic aspects of bodily reality, it is enough to stop at the configuration and movements of the hands for the dazzle to take over us."

The consumer industry seeks to create desires to entice people to buy. It begins to establish positions of social status accordingly: with what one wears, eats, walks, etc., creates certain clothing brands that place their users in a prominent position, bars or fashionable places are chosen, which are frequented by so-called intellectuals, or those who have money, some parties born in the middle of the poorest population (Bonfim festival) have their counterpart for the rich (Bonfim light). To Mike Featherstone (1995, p.123)

"The new heroes of consumer culture, instead of adopting lifestyle in an unthinking way, in the face of tradition or habit, transform style into a life project and manifest their individuality and sense of style in the specificity of the set of goods, clothes, practices, experiences, appearances and bodily dispositions destined to compose a lifestyle."

These messages are present in commercials, in store windows, in magazines, in other words, practically everywhere we are. Physical Education itself through sport reinforces certain stereotyped postures of the body, as shown by Professor Belarmino Costa: (2006, p. 196)

"Mass sport, and with it the construction of characters and images that celebrate the human ideal of overcoming, beauty and self-control, as appropriated by the culture industry, represents an extension of the rationalizing logic of the market."

What we observe within this problematic are people living in eternal conflict, where their desires are confronted with those produced by the consumer society. Bodies that run on the waterfront, bodies in the corridors of shopping malls, bodies that walk to work, bodies that look for themselves in the mirrors produced by society. Are we aware of the reason for this movement? And what are we looking for with it?

What we do know is that more and more people are suffering from loneliness, depression and feelings of inadequacy, fruits of a society that values the ephemeral and the constant mutations

leading us to a feeling that everything is passing too fast and that we must make the most of it and end up enjoying nothing, if we don't even know what we want! Couto (2000, p. 248) defines this relationship very well in the modern world.

"In electronic culture, everything needs to have its own accelerated pace. The sophistication of the society of communication and informational technologies legitimizes the spiral of multiplicity. It is the core of a universe that survives on the rapid, incessant and fragmented circulation of all information, images and canons. It offers man the pleasure of overcoming the slowness, the timidity of physical dispositions and the traditional operations of human logic. It has become imperative to live in a state of urgency."

Body awareness in Physical Education is presented in several lines of thought, to authors who understand that some techniques of body work such as: yoga, stretching, tai chi chuan. Professor Flávia Alves (2008, p. 366) in one of her works on this theme comes to the following conclusion.

"The work with touch and trust gave a dimension to body awareness in the relationship that was established with the other, however, it was necessary to reach another dimension of body awareness, starting from the relationship of the body with itself."

The body is in Physical Education its genuine object of study, when Plato said "music for the soul and gymnastics for the body" at that time a "decree" was established that exercise for the body is something necessary for the totality of the individual's formation.

CONCLUSION

The search for social acceptance leads people to act unconsciously in the face of what they really want, and ends up associating being beautiful, being desired and happy with body stereotypes.

When we construct an image for the body, it is not only what is seen that is shaped. In the law of marketing, the image of a product has to be associated with its quality and efficiency.

When we seek a slim and shapely body, we are passing on the image of productive, dynamic, sensual and desired beings

Physical Education, which has as its object of study the body in movement, is necessary that its professionals reflect on a critical perspective the concepts that were discussed in this study in order to have a more reflective practice that better serves society.


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Visibility to empowerment fostered using concept maps in the study of abstract biological concepts

 <https://doi.org/10.56238/sevned2024.014-020>

Elineí Araújo-de-Almeida¹ and Roberto Lima Santos²

ABSTRACT

The concept mapping technique enables personal and collective autonomy, promoting the exercise of various cognitive skills, which favor creativity and logical thinking. Due to the importance of practices related to the construction of scientific texts, the objective of this article was to highlight products developed in the course of teaching and learning, using concept maps, as a way to signal evidence of empowerment in the study of little-known zoological taxa. The present investigation used the methodology of content analysis to examine the publications developed by students with the authors of this paper and associated researchers. Specifically, productions that used the conceptual integration tool to elucidate taxonomic, phylogenetic and ecological contents on neglected fauna groups were selected for analysis. The documents analyzed indicated that, by mobilizing the study of abstract concepts related to enigmatic invertebrates, with the elaboration of scientific writings disseminating biodiversity, an active participation of students is promoted. Experiences of this nature reflect evidence of empowerment in higher education, in addition to increasing the sense of belonging to biological diversity and its environmental interactions.

Keywords: Active learners, Enigmatic biodiversity, Scientific writing, Research in teaching.

¹ PhD of Science (Zoology)

Professor, Department of Botany and Zoology, Federal University of Rio Grande do Norte, Brazil

E-mail: elineiaraujo@yahoo.com.br

ORCID: <https://orcid.org/0000-0003-1617-5641>

² MSc in Biological Sciences (Zoology)

Biologist at the Department of Botany and Zoology, Federal University of Rio Grande do Norte, Brazil

E-mail: robertolsantos@yahoo.com.br

ORCID: <https://orcid.org/0000-0003-1864-0295>

INTRODUCTION

Concept maps are graphical devices used to organize and build knowledge. Dr. Joseph D. Novak, author of this pedagogical innovation, points out that this type of graphic scheme was developed in the 1970s at Cornell University (Novak & Gowin, 1996; Novak & Cañas, 2007, 2008, 2010) and is constantly evolving (Novak & Cañas, 2006). From a personal and collective emancipatory perspective, the conceptual mapping technique, according to Novak (2002, 2013) and Ålhberg (2013), is a tool that promotes intellectual skills conducive to the empowerment of teachers and learners, by favoring teaching, learning and research. Moreira (2011) points out that Novak's (1977) humanistic approach to meaningful learning, grounding the positive and constructivist integration of thoughts, feelings, and actions, leads to human empowerment. In this context, those who acquire the ability to map concepts, based on the Theory of Meaningful Learning developed by Ausubel (2000), can achieve a promising way of thinking about a given subject.

In search of motivational elements in the process of acquiring knowledge, the teaching tools that add values that enhance the learner, according to Broom (2015), constitute alternatives for teachers to put in their pedagogical practices. As stated in Skene (2021), in recent years, empowerment has become a central theme in many fields of the social sciences, from human geography to business studies and in social movements for change. According to Calvès (2009), the notion of empowerment occupies a prominent place in the contemporary discourse of international institutions on the participation of the financially disadvantaged in development programs.

The idea of emancipation in the educational field had one of its first achievements in the social work led by Paulo Freire (Freire, 1972; Urbanowicz, 2020; Skene, 2021), and has been highlighted for being an empowering factor in the path of academic training, when referring to scientific writing. Several authors, such as Fahmi et al. (2020), Richards (2021), Jamil (2023), Nikkhah (2023), Permana et al. (2023) and Sari et al. (2023) highlight the ability to construct scientific texts, characterizing it as of great importance in the teaching and learning process, with potential to foster empowerment in the classroom.

Choosing concept maps as learning tools and research objects in the course of teaching abstract concepts of biology, Araújo-de-Almeida & Santos (2018, 2021), Araújo-de-Almeida et al. (2019a, b, 2020, 2021, 2022, 2023), Dias-da-Silva et al. (2019a, b, 2023) and Aciole et al. (2022, 2023, 2024) are examples of works that explain, at different times, data about the insertion of these visual instruments in the study of Phylogenetic Systematics, Zoology and Environmental Education. In these publications, the use of the conceptual mapping technique is also an element to promote the dissemination of important themes, but little discussed in the classroom, such as enigmatic invertebrates. The visual structuring of conceptualizations about these invertebrates, considered enigmatic in the sense of Blaxter et al. (2004) and Brusca et al. (2016, 2023), thus becomes pertinent;

since, their descriptions are complex and abstract. According to Brusca et al. (2023), invertebrates make up approximately 96% of the documented zoological diversity and, according to Eisenhauer et al. (2019), their representatives may be threatened or in the process of extinction.

A large number of invertebrate fauna, in addition to their intrinsic value, are essential in the maintenance of ecosystem functions and, therefore, for the conservation and balance of the environment (Wilson, 1987; Wilson & Peter, 1997; Santos, 2011; Tilman et al., 2014; Scudder, 2017; Brusca et al., 2023), however, Araújo-de-Almeida et al. (2011, 2020) state that little attention is paid to enigmatic invertebrates, especially when it comes to the teaching of zoology. Therefore, there is a call for a contextualized pedagogical content, with the need for strong appeals to environmental and social issues. Thus, concept maps have the opportunity to integrate knowledge about biodiversity with environmental education and promote public awareness, disseminating knowledge produced (Araújo-de-Almeida et al. 2023; Viana et al., 2023).

The use of visual instruments in communication about biodiversity contributes to the realization of what was recommended in article 13 of the Convention on Biological Diversity and in Component 6 of the National Biodiversity Policy (Decree No. 4,339/2002), which also deal with the dissemination of information on biological diversity, its conservation and sustainable use (see Brasil, 1998, Araújo-de-Almeida et al., 2023). In addition, the "ecologically balanced environment", according to the provisions of the *caput* of article 225 of the 1988 Constitution of the Federative Republic of Brazil (CRFB88), is considered by Milaré (2015) as a fundamental constitutional right and, according to Brasil (1988), its effectiveness implies, according to article 225 § 1º VI of the CRFB88, the promotion of "environmental education at all levels of education and public awareness for the preservation of the environment".

Recognizing the relevance of the exercise in the technique of conceptual mapping and the construction of scientific writings, contextualized with environmental problems, the objective of this article is to address a set of publications, with the participation of students, throughout the teaching process, using concept maps in the construction of knowledge, to evidence the empowerment in the study of abstract concepts related to little-known zoological taxa.

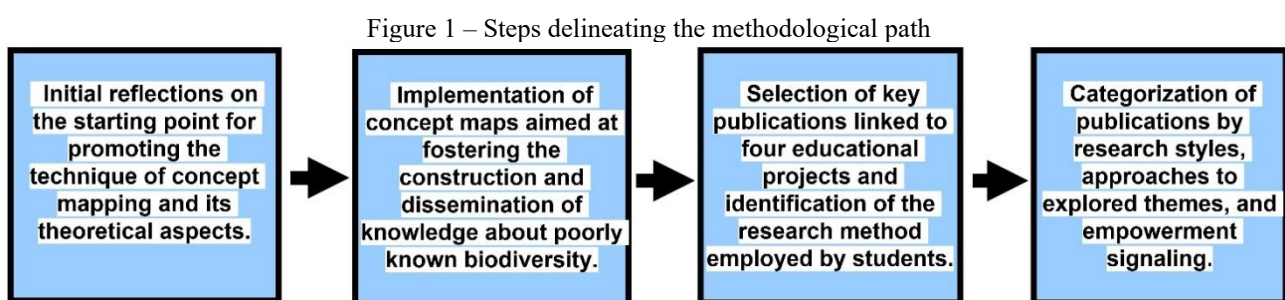
METHODOLOGY

This work follows the qualitative research model, with the application of elements of content analysis systematized by Bardin (2013, 2016), to direct the bibliographic survey and elaboration of categories from a set of publications developed by students participating in teaching initiation projects. The writings collected used the concept maps in the exploration of abstract biological subjects. In 2016, the first publication record was released, addressing this graphic device, linked to the Laboratory of Research in Zoology Teaching (LaPEZ), Biosciences Center (CB), Federal

University of Rio Grande do Norte (UFRN), but, specifically, this research focuses on publications developed from 2019 onwards. The central idea was to emphasize the teaching projects registered with the Dean of Undergraduate Studies (Prograd) of UFRN. In this aspect, they involved the work of nine monitors linked to the teaching projects, in collaboration with four volunteer students engaged in learning the concept mapping technique and in the subsequent production of academic writings for publication in scientific vehicles.

As it is an investigation of the practice itself, this article is a space for reflection that documents an experience that began in 2015, thus encompassing, in this formative path, nine years of continuous interactions focused on scientific studies on little-known animals, using concept maps as the main methodological artifact. The reflections presented were inspired by Lyle (2018), Lira and Passeggi (2021), Passeggi (2021) and Suárez (2021). This study also constitutes an experience report regarding the positive actions carried out in the classroom, as outlined by Araújo-de-Almeida et al. (2019b).

By fostering the elaboration of contextualized concept maps through scientific writing while teaching, it was possible to build knowledge about animal biodiversity in several publications, contemplating different styles of texts. As seen in Aciole et al. (2023), these pedagogical materials have been used in the classroom and have also been the object of reflective analyses on the constructive path in general. To fulfill the objectives of the research, highlighting the importance of these teaching products for the empowerment of the students involved, the methodological path illustrated in Figure 1 summarizes the four topics that outlined the description of the process:



Source: Authored by the authors.

As a starting point, it is important to reflect on the initiative of a graduate student, when she produced, together with the first author of this article, the first formal record involving the use of the concept maps and theoretical references adopted. Highlights of the works that address this path, in the initial phase, are also given to undergraduate students and related researchers, including the participation of a full professor at the Federal University of Paraíba (UFPB).

Regarding the construction of knowledge using the concept mapping technique, in order to achieve the elaboration of writings focused on learning and dissemination about enigmatic

biodiversity, the students associated with the projects received constant guidance from the authors of this writing. This training process took place both through individual and team care, mainly through courses and/or pedagogical workshops. The composition of projects by the students, to structure the scientific research, was of great importance in the initial phase. The planning stage was discussed in Araújo-de-Almeida and Santos (2021), where it is highlighted that the fulfillment of this requirement allows for more precise structuring of the contextualization of the text covering: Title, Introduction, Objectives, Methodology, Results, Discussion, and References. Developing a structuring of writing, in this aspect, is an exercise in scientific research, which, according to Scarpa (2016), involves stages and ways of reasoning and communicating that culminate in typical argumentative processes.

Throughout the process of advising students, guidelines for the construction of three research models were established. Among the types of writings fostered, experience reports, content analysis research and research focused on key concepts stand out. Pertinent to the training of the students, in this sense, instructions were made possible that would lead to the search, in a collective way, of the concepts that would answer the structuring focus question of the desired conceptual map. From then on, each student, as a team, had the opportunity to choose the most appropriate model for their specific interest, in order to prepare an unpublished and innovative scientific writing.

Regarding the selection of key works and identification of the writing style and the biological theme explored, all the productions developed by LaPEZ participants were verified, to investigate these publications, from the year 2019, when the action of the Teaching Projects began exploring content about little-known animal organisms using the conceptual mapping technique. The article by Aciole et al. (2023) was considered to be of great relevance, with regard to the initial bibliographic survey of the works of the present investigation; Thus, the analysis process intended in the research objective was facilitated. The criterion for selecting the respective texts, in the more detailed study, was the *status* of the publication, whether in a journal or book chapter. In this sense, works published in annals of events and those that were republished were excluded from the analysis. Continuing the path, in order to categorize the selected works and continue focusing on the opportunities for emancipation of the student, as the protagonist of the experience, the publications that occurred in the course of action in the teaching projects, contemplated one of the aspects of the research:

- a) Elaboration of experience reports as scientific products, as emphasized by Suárez (2008) and Daltro and Faria (2019).
- b) Content analysis research with thematic summarization of the published publications, following the content analysis developed by Bardin (2013, 2016).
- c) Research focused on key concepts, as verified in Novak and Cañas (2008, 2010), by considering concept maps as a research tool.

RESULTS AND DISCUSSION

Before dealing with the experience with the elaboration of concept maps discussed in the scientific writings published by the students and which helped in the course of teaching about the little-known animal biodiversity, some previous evidences related to empowerment, in the investigative beginning of the conceptual mapping technique, are highlighted. After these initial observations, the rationale of the study regarding the publications linked to the teaching projects that were developed from 2019 onwards allows us to verify the visibility of the aggrandizement provided by the documented experiences.

THE STARTING POINT TOWARDS SCIENTIFIC PRODUCTIONS WITH CONCEPT MAPS ON BIODIVERSITY

The article by Monteiro and Araújo-de-Almeida (2016) signaled the beginning of the journey in relation to the experiences recorded in publications that indicated the use of the concept mapping technique exploring topics on biodiversity. This article, entitled "The environmental theme conveyed through concept maps", preceded a series of publications addressing this resource of conceptual integration in the teaching and research process. The theoretical frameworks on concept maps, including Novak and Cañas (2008), Moreira (2006, 2010) and Novak (2010) were explained in this publication. Regarding considerations about the environment, Ahlberg et al. (2001) and Chaiben et al. (2011) were cited as references in the approach to environmental education using such graphic devices.

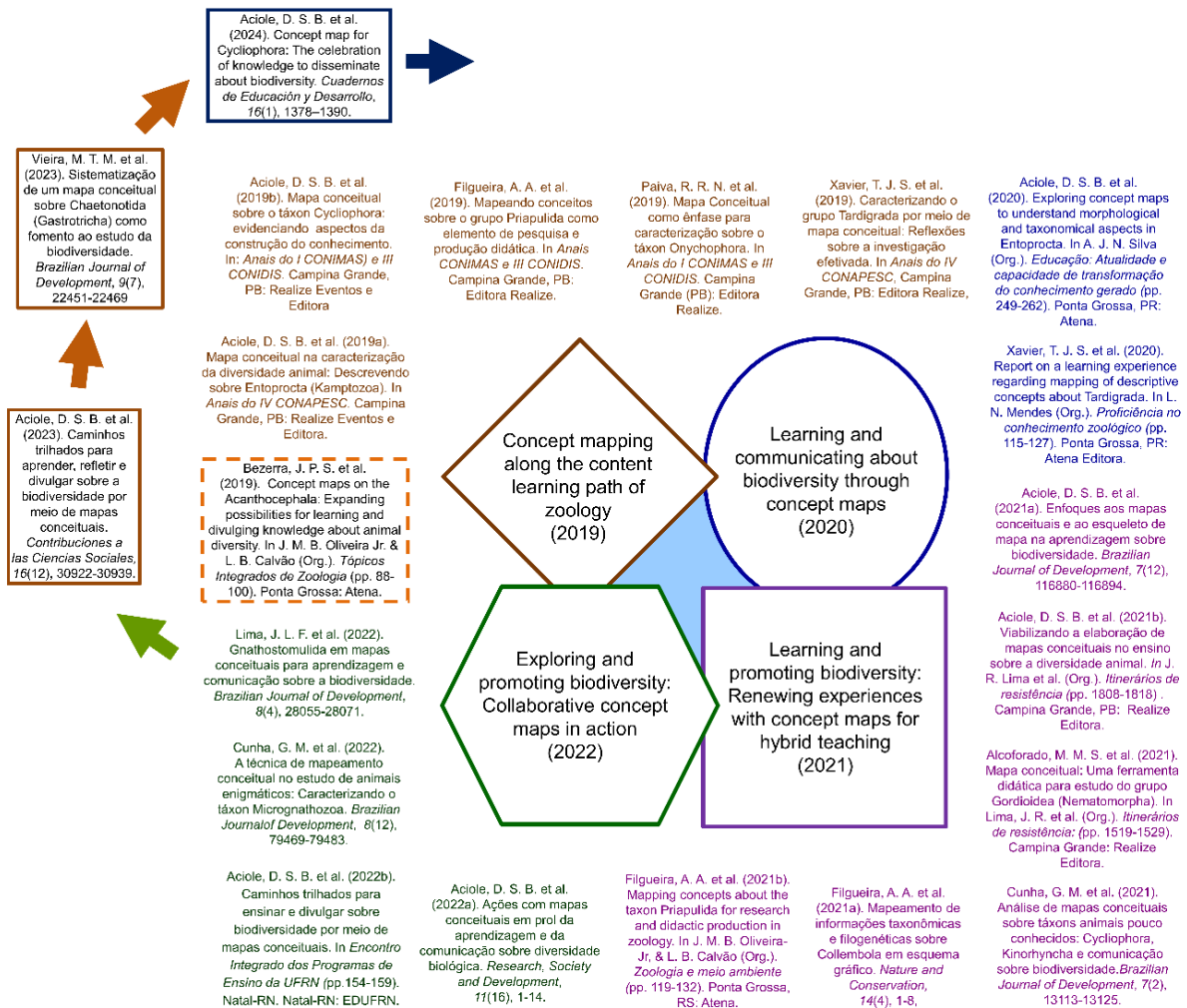
In anticipation of pedagogical experimentation, Araújo-de-Almeida and Santos (2018) address the first productions developed by students enrolled in the disciplines that address animal diversity in the undergraduate course in Biological Sciences at CB/UFRN. The experiments with concept *mapping tasks* developed in the classroom encompassed the study of the little-known diversity of invertebrates. Additionally, the works published by undergraduate (Bezerra et al., 2019) and graduate students (Dias-da-Silva et al., 2019a, b, 2023) are examples of the use of concept maps in the course of teaching invertebrate zoology. These publications highlighted several bibliographic sources that support the theoretical basis of concept maps, such as Moreira (1980, 2011), Novak and Gowin (1996), Novak and Cañas (2006, 2008, 2010), Hay et al. (2008), Kinchin (2011), Aguiar and Correia (2013), Ålhberg (2013), Cañas et al. (2015), and Correia et al. (2016), among other authors.

THE PUBLICATIONS COLLECTED AND THEIR CONNECTIONS TO THE TEACHING PROJECTS

Highlighting the teaching projects as organized in the scheme of Figure 2, for each year of operation, the following are the following: (a) "Conceptual mapping in the course of learning content

in zoology", conducted in 2019, resulting in five publications; (b) "Learning and communication on biodiversity through concept maps", developed in 2020, with two publications; (c) "Learning and dissemination about biodiversity: Renewing experiences with concept maps for blended learning", carried out in 2021, totaling six publications; and (d) "Knowing and Disseminating About Biodiversity: Collaborative Concept Maps in Action", concluded in 2022, with four publications.

Figure 2 – Illustrative scheme of the four teaching projects that promoted actions for the elaboration of writings addressing the concept maps about enigmatic taxa.



Fonte: Expanded from Acirole et al. (2023, p. 30929).

The various publications that took place over the four years of the teaching projects, chronologically circulating the different geometric figures, provide a panoramic view of this trajectory. The insertion of the book chapter on the taxon Acanthocephala, by Bezerra et al. (2019), highlighted in the rectangle with dashed borders, corresponds to a highlight of the publication that fostered the interest of students who applied for selection as teaching assistants in the project carried out in 2019. With the addition of publications of importance to the study, which occurred before and after the implementation of these projects, the total number of 21 publications surveyed was totaled, which were selected as a sample for analysis.

In view of the growing number of scientific writings generated in 2022, the articles arising from this demand, published in the years 2023 and 2024 were thus included in this analysis. Thus, in addition to this square of 18 publications, the writings of Aciole et al. (2023, 2024) and Vieira et al. (2023) are added, thus informing the continuity of the action. In the new cycle, which started in 2023, the titles of the publications are inserted in rectangles. The panorama in Figure 2, when adding the publications carried out from the year 2023 onwards, illustrates a spiral movement, whose direction of the arrows makes explicit the intention to create a new cycle.

PARTICIPATION OF STUDENTS IN PUBLICATIONS LINKED TO TEACHING PROJECTS

Although the students' productions associated with the teaching project carried out in 2019 were primarily published in annals of scientific events, they contributed to a comprehensive vision that was progressively enriched over four years of implementation of teaching actions. In fact, the improvement of the concept maps and the context of the information explored in the scientific articles continued throughout the classes in remote format (2020-2021) in the period of health restrictions resulting from the Covid-19 pandemic. In the year 2020, some of the writings presented in annals of scientific events were selected for review and expansion, culminating in publication as articles or book chapters, for example, Aciole et al. (2020) and Xavier et al. (2020). Continuing the process, the work made possible from 2021 onwards includes Aciole et al. (2021a, b, 2022, 2023, 2024), Alcoforado et al. (2021), Cunha et al. (2021, 2022), Filgueira et al. (2021a, b), Lima et al. (2022), and Vieira et al. (2023).

According to the exclusions of some writings in the final study sample, the 15 publications categorized into the three different typologies of scientific writings are in accordance with the students' choices and the scope of their skills around the research style adopted. Thus, three different types of documented productions are emphasized: (a) experience reports based on academic experiences; (b) content analysis research from produced documents; (c) research focused on key concepts as an exercise to clarify the contents. The concept maps, explained in Figures 3, 4, and 5, illustrate, respectively, a synthesis of the methodological process on each of these types of investigations.

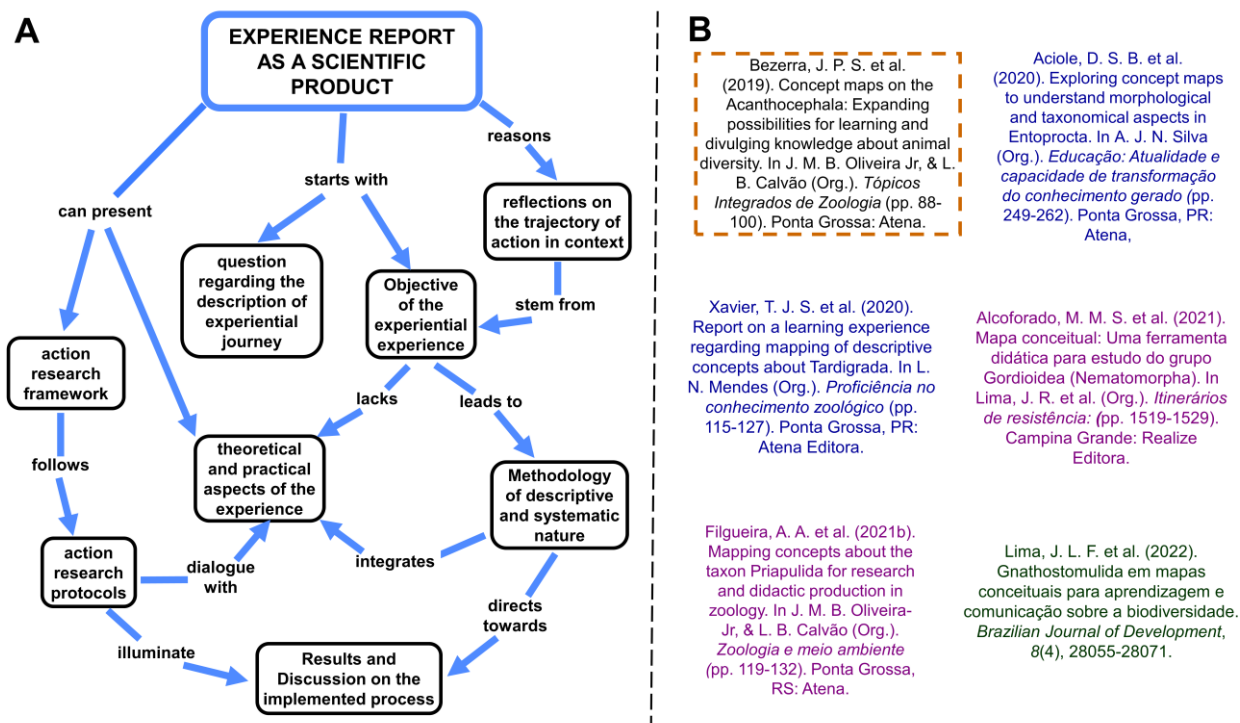
PRODUCTIONS BASED ON ACTIVITIES EXPERIENCED BY STUDENTS IN THE EXPERIENCE REPORT CATEGORY

Explaining the process of constructing the experience reports, Figure 3A presents a conceptual map that summarizes the main elements involved in this genre of writing, used to support the study of concept maps in the exploration of abstract biological contents. This scheme emphasizes this type of writing as a scientific product and serves as a basis for reflections on the knowledge

experienced through a mobilization of contextualized practice. The action is outlined from a specific investigative question and a clearly defined objective; It is also driven by an appropriate methodology that allows you to achieve the results and promote relevant discussions. When the research is developed collaboratively, it expands the possibilities of interactions between participants, while enabling, according to Yaacob et al. (2021), critical thinking through reflective learning. In addition, the conceptual map contained in this scheme highlights that this writing model can originate from an action research, which, according to Tripp (2005), is a modality of action research of great importance in a reflective practice.

As an experience of empowerment with the concept maps based on scientific writings, the students linked to the teaching projects experienced aspects of reflective writing about the path lived. In this style of writing, six works involving several students stand out. Represented in Figure 3B, the following belong to this list: Bezerra et al. (2019), in the study of the taxon Acanthocephala; Aciole et al. (2020), in the conceptual explorations on Entoprocta; Xavier et al. (2020), in their research on the Tardigrada lineage; Alcoforado et al. (2021), in the details about Gordioidea (Nematomorpha); Filgueira et al. (2021b), in the in-depth studies on the Priapulida taxon, and Lima et al. (2022) in the conceptual specifications related to the Gnathostomulida group.

Figure 3 – Concept map highlighting what an experience report is about and examples of related productions.



Source: Authored by the authors.

As it is a writing that can be constructed by apprentices in undergraduate courses, experience reports, as seen in Araújo-de-Almeida et al. (2019b), are very appropriate for a reflective evaluation. According to Kolb and Kolb (2018), reflexivity is present in the learning cycle proposed by David

Kolb (1984), which includes the related stages: experiencing, reflecting, thinking, and acting. The links with reflective practices, at the moment in which the experience report is constructed, show the existence of a reflection on action and another on action, defended by Schön (1987). By expanding the reflexive aspect of the experience report, it is possible to recover the steps of the trajectory, thus going through the cycle proposed by Gibbs (1988), which includes: description, perception, evaluation, analysis, conclusions, and action plan.

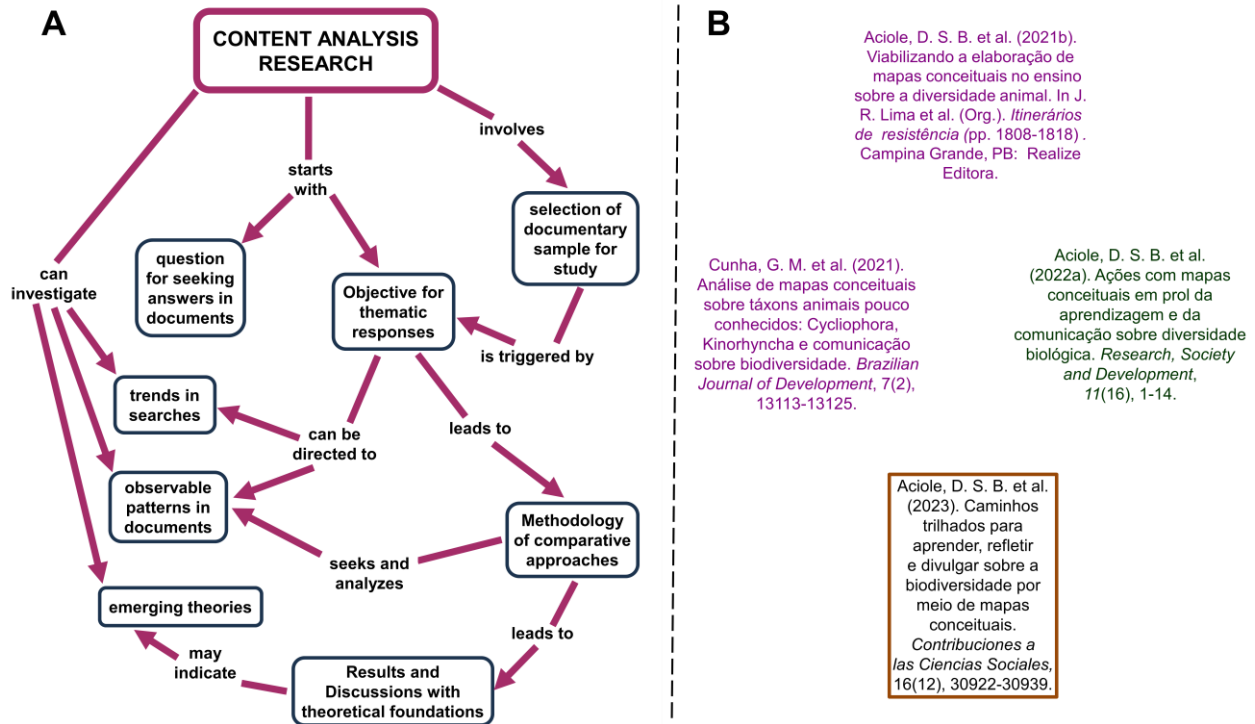
According to Daltro and Faria (2019), experience reports, as objects of analysis, are scientific narrative documents aligned with a postmodern approach. For Suárez (2008), when classroom practices and experiences are reflected, interpreted, reported and made public, they correspond to unique sources of research and pedagogical criticism that guide the revision of views on the academic world. In terms of empowerment in the formative process, according to Passeggi and Lira (2023), narrating an experience allows us to experience the three exercises of telling: reflecting, arguing, and reconstructing, in order to emancipate the subjects, in their historical temporality.

PRODUCTIONS DEVELOPED BY STUDENTS IN THE CONTENT ANALYSIS RESEARCH CATEGORY

The structuring of a concept map, highlighted in Figure 4A, evidences informative propositions about the research carried out, using the content analysis method, following Bardin (2013, 2016), and how it was thought and structured to support the student's writing. This research approach makes it possible to apprehend trends and new discoveries about researched content, which, according to Moraes (2003), may signal the emergence of a new theory. Being a structured and recognized research style in the investigation of a scientific problem, it recognizes a focal question linked to an objective leading to a corresponding methodology. According to Bardin (2013, 2016), the content analysis methodology contemplates the selection and investigation of a significant sample of the research problem so that the results and discussions appropriate to the formulated question can be reached.

In view of the advances in the construction of scientific works, the set of publications, added over the period, generated possibilities for carrying out various researches applying content analysis. Figure 4B includes the four studies published in this category: Aciole et al. (2021), in the explanations about the feasibility of developing concept maps in the study of animal diversity; Cunha et al. (2021), with a comparative analysis between two publications that explored morphological and phylogenetic characteristics related to the taxa Cyclophora and Kinorhyncha; Aciole et al. (2022, 2023) in the development of the state of the art regarding publications addressing neglected invertebrates that were deepened in the Laboratory of Research in Zoology Teaching.

Figure 4 – Illustration of a concept map explaining what a content analysis survey is about and examples of corresponding publications.



Source: Authored by the authors.

Content analysis is a method that allows the use of analytical and synthesis reasoning, including the study of speeches given and documented. Laurence Bardin's work, cited here in two versions (Bardin, 2013, 2016), in French and Portuguese, respectively, systematizes the reasoning about a methodological process of investigation that has been well applied in theoretical research and analysis of questionnaire responses. By discussing the content analysis technique as a research instrument on a theme developed in the authors' own practice, it is possible to visualize simplifications about the research process carried out. In addition, the analysis of the theme based on a sample of significant documents, for the study of a taxon, broadens the understanding of the problem (Araújo-de-Almeida et al., 2020).

STUDENT-LED PRODUCTIONS IN THE CATEGORY OF RESEARCH FOCUSED ON KEY CONCEPTS

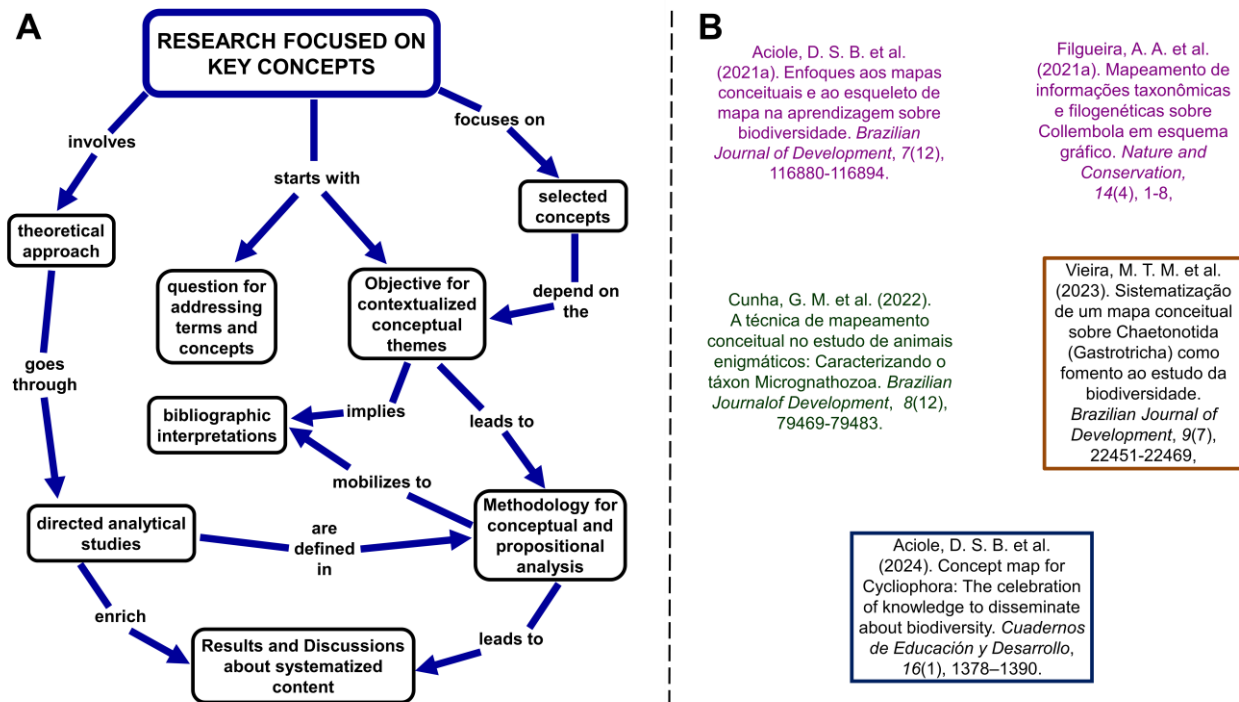
To ensure the rigor of an investigation, it is essential that the concepts are clearly defined and, in this sense, Wong et al. (2020) highlight the importance of clarifying scientific concepts and propose a theoretical scheme that defines these attributes. According to Memory (1990), Musheno and Lawson (1999), the comprehension of the terms of a content is necessary, deserving special attention before, during, and after the reading of a subject. In this conception, concept maps were used by Araújo-de-Almeida et al. (2019a) to illustrate interactions between the concepts used in

Phylogenetic Systematics, thus providing a more dynamic understanding of the various terminologies related to this subject.

As a model of scientific construction, to describe complex biological concepts related to the subject of study, a theoretical writing style focused on the exploration of concepts was adopted, as illustrated in Figure 5A. When applying the concept mapping technique in the systematization of knowledge, it is necessary to follow convincing scientific protocols that justify a scientific question to define the intended objective and guide the methodological path. Following these basic assumptions, the following rhetoric must be supported, like any scientific research, on theoretical foundations. Moreover, making use of maps in an investigation is, according to Wheeldon and Åhlberg (2012), another way of visualizing research and reflecting on the processes and decisions it requires.

With the support of a team skilled in the concept mapping technique, along with the demands of the classroom for published works involving concept maps on little-known animal diversity, some writings became necessary for conceptual studies. The visual schemes were contextualized as an object and research method and underwent a theoretical discussion, supporting an enlightening text. This made it possible to build didactic materials for teaching and disseminating biological diversity. Figure 5B shows, in this category, a total of five publications, in which the following participated: Aciole et al. (2021a), with the production of a skeletal concept map on Kamptozoa, in the previous triggering in order to add the necessary propositions to the focal question; Filgueira et al. (2021a), for the elaboration of a conceptual map on Collembola, which is of great importance in the study of the evolution of the Hexapoda; Cunha et al. (2022) and Vieira et al. (2022), for their illustrative description of the taxa Micrognathozoa and Chaetonotida (Gastrotricha), respectively. Citing Aciole et al. (2024), who went beyond teaching projects, with the proposition of a conceptual map containing morphological characters based on research on Cycliophora, for the celebration of biodiversity.

Figure 5 – Specification of a concept map illustrating what an investigation focused on concepts and examples of associated work is about.



Source: Authored by the authors.

It is worth noting that, from the perspective of developing good concept maps expressing propositional clarity in the scientific knowledge about animal diversity under study, the recommendations made by Novak and Cañas (2008, 2010), Aguiar and Correia (2013) and Cañas et al. (2015) were essential. And, as highlighted in Araújo-de-Almeida et al. (2019a, 2020), it is also necessary to structure the survey of concepts, based on specialized and conceptually validated bibliographies. In addition, the production of these visual schemes, in its constant evolution, benefited from the support of the *CmapTools software* developed at the Institute for Human and Machine Cognition (IHMC) (see Cañas et al., 2003). This *software* made the construction of concept maps more efficient, considering the search for semantic clarity in the propositions presented therein. This digital support, available free of charge and appropriate for making conceptual connections through linking words and arrows, reinforces the possibility of motivating learners with the use of the concept mapping technique (Dantas et al., 2021). The use of the *CmapTools* tool allows you to reduce the time spent on the elaboration of concept maps when compared to the laborious work required to manually make these graphic organizers.

FINAL THOUGHTS

The conclusions drawn from the various publications investigated and organized into three categories of scientific construction styles, namely, experience reports, content analysis and research focused on key concepts, show that the study of these enigmatic invertebrates provided opportunities

for students to take active roles in the investigation of these organisms. With the academic writings disseminated, the dissemination of general knowledge about biodiversity to a wider public was promoted, as well as technical information and important bibliographic references related to the mapped taxa, which often circulate only among specialists.

By noticing the advances in the experiences accumulated over nine years of academic production with the conceptual mapping tool, it is possible to affirm that this technique has been a relevant method in the production of academic content. The materialization of the works addressing phylogenetic, zoological and ecological concepts, makes visible the pedagogical empowerment and increases the sense of belonging in relation to the animal diversity little studied. Moreover, innovation in teaching, by fostering the publication of scientific writings, helps to build knowledge that returns to the classroom at a later time. Activities of this nature can also contribute to training and empowering both those who teach and those who learn.

Considering that conceptual mapping seeks to organize knowledge on any subject graphically, in a synthetic way, the acquisition of skills of this type becomes useful in the experience of intellectual empowerment, not only in teaching about animal diversity and related themes, but also in the exploration of diversified studies. In this way, the published publications, exploring different styles of writing, become examples to be considered in the methodological process of diverse academic research. In addition, with the possession of academic records, situated in space and time, there are valuable biographical subsidies to be revisited and that can be used to confront the past with the present and then evoke the voices that echo and transform the trajectories lived.

This study, addressing a set of experiences in addition to the contributions resulting from four teaching projects, reveals the renewal intentions that are being promoted through new constructions of projects and various publications, in the training of undergraduate students with a focus on environmental education (see Araújo-de-Almeida et al., 2023; Viana et al., 2023). Initiatives in this sense, to broaden the themes of the construction of concept maps beyond the study of enigmatic animals, include the prospect, in progress, of carrying out new research, revisiting other themes such as the fauna associated with various organisms, for example, the bivalve mollusks *Brachidonts* and bromeliads and psammophytes.

THANKS

We express our gratitude to the Dean of Undergraduate Studies of the Federal University of Rio Grande do Norte (UFRN), for the valuable financial support that subsidized students in the four teaching projects, where we explored the concept maps in the study of invertebrate biodiversity in the Undergraduate courses in Biological Sciences and Ecology. We are also grateful to the students who engaged in this trajectory in search of the construction of innovative and transformative



pedagogical knowledge. We emphasize our special thanks to the anonymous evaluators of the 9th International Conference on Conceptual Mapping, held in Malta in 2022, for their relevant contributions to the abridged version, in scholarly communication format, which was submitted and accepted for presentation at this event. The observations made by these evaluators motivated the updating and expansion of the ideas in this text. We also take this opportunity to offer a special tribute to Dr. Joseph Donald Novak (*In Memoriam*) for his contributions in the development and improvement of the concept mapping methodology.

We would also like to thank you for the opportunity to compose this chapter with the re-presentation of the article: Araújo-de-Almeida, E., & Santos, R. L. (2024). Visibility to empowerment fostered by the use of concept maps in the study of abstract biological concepts. *Research Society and Development*, v. 13, n. 5, p. 1-16. DOI: 10.33448/rsd-v13i5.45869.

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PMAQ-AB as a tool for public governance in health: Experience report care management in the territory

 <https://doi.org/10.56238/sevned2024.014-021>

Carine dos Santos Cardoso¹, Melissa Watanabe², Silvio Parodi Oliveira Camilo³ and Fabiane Ferraz⁴

ABSTRACT

Considering the assumptions of public governance and the importance of achieving greater effectiveness in health services, from 2011 to 2019 the federal government developed the National Program for Improvement of Access and Quality of Primary Care (PMAQ-AB), whose proposal was to promote expanding access and improving the quality of Primary Health Care, with greater transparency and effectiveness of actions according to the particularities of each location. The present work aims to report the experience about how adherence to PMAQ-AB occurred in a small city in southern Santa Catarina, expressing the benefits achieved and how this proposal is linked to the assumptions of public health governance. Based on the theoretical support of public governance and public governance in health, it became possible to conclude that the PMAQ-AB, when implemented and implemented in the municipality, proved to be an important tool for the institution of public governance principles, especially when dealing with the improvements provided at the local level, including the computerization of work processes, the acquisition of vehicles and the remuneration for performance of public agents involved in the program, providing greater involvement and accountability, efficiency in the provision of services and greater capacity to respond to citizens.

Keywords: Health Sector Stewardship and Governance, National Health Programs, Quality Assurance, Health Care, Family Health Strategy.

¹ Nurse. Dr. student in Socioeconomic Development at the University of the Extreme South of Santa Catarina (PPGDS-UNESC). Master's Degree in Collective Health – Professional Master's Degree, from the University of the Extreme South of Santa Catarina (PPGSCol/UNESC). Specialist in Family Health Strategy; Clinic Management in Health Regions; Health Economics.

E-mail: casc@unesc.net

² Doctor in Agribusiness. Master's Degree in Business Administration. Permanent Professor of the Graduate Program in Socioeconomic Development at the University of the Extreme South of Santa Catarina (PPGDS/UNESC). Coordinator of the Observatory of Socioeconomic Development and Innovation.

E-mail: melissawatanabe@unesc.net

³ Post-doctorate in Accounting-PPGC-UFSC. Dr. in Administration and Tourism from the University of Vale do Itajaí (UNIVALI). Professor of Graduate Studies of the Master's and Doctorate in Socioeconomic Development (PPGDS/UNESC).

E-mail: parodi@unesc.net

⁴ Nurse. Doctor in Nursing. Professor of the Graduate Program in Collective Health – Professional Master's Degree, University of the Extreme South of Santa Catarina (PPGSCol/UNESC).

Member of the Research Group on Care Management, Comprehensiveness and Health Education (GECIES).

E-mail: fab.ferraz@unesc.net

INTRODUCTION

Public Governance is a multidisciplinary term originating from Corporate Governance applied to the management of private companies, currently used with a dimension that aims at the better functioning of the State in various spheres of government, designating political actions that involve a set of leadership, strategy and control mechanisms that guide practices of managers and public agents, in order to "evaluate, directing and monitoring management, with a view to conducting public policies and providing services of interest to society" (BRASIL, 2017, n.p.).

The purpose of the governance of the public sphere is due to "public concerns about the capacity of their political systems to act effectively and decisively in order to solve public problems", especially those related to health systems, in view of the high demand and scarcity of resources, which constitute the root of the problem of contemporary public management (PETERS, 2013, p. 28).

In Brazil, the definition of Public Governance presented stems from Decree No. 9,203, of November 22, 2017, which provides for the governance policy of the direct, autarchic and foundational federal public administration. In the aforementioned official act are the general provisions that involve the application of the governance process in the public sphere, within the scope of the federal government, including principles and guidelines (BRASIL, 2017).

Such principles and guidelines for Public Governance in the It is under the coordination of the Interministerial Committee on Governance (CIG), which constitutes the starting point for the institution of a governance policy, which, although it is something recent, demonstrates a gradual and constant process, which will allow public institutions to achieve their objectives aligned with the social interest, with coherence and consistency, considering that public governance is nothing more than "the ability to set goals for society, as well as the ability to develop programs that allow these goals to be achieved" (BRASIL, 2018, p. 13).

Regarding this concept, the Court of Auditors of the Union (TCU) highlights the It is important to consider the relationship between Public Governance and Management, because, while

[...] Governance is the directing function, management is the accomplishing function. [...] while governance is responsible for establishing the direction to be taken, based on evidence and taking into account the interests of Brazilian society and stakeholders, management is the function responsible for planning the most appropriate way to implement the established guidelines, execute the plans and control indicators and risks (BRASIL, 2021, n.p.).

Given the variation of meanings presented by the term "Public Governance", which the TCU calls "Axes of Signification", the need to highlight that Public Governance can occur in three perspectives, which are:

- 1) Organizational (or corporate) Perspective, which deals with the conditions for each body or entity to fulfill its role, align its objectives with the public interest, manage risks and deliver the expected value in an integral, transparent and responsible manner;
- 2) Public Policy Perspective, which deals with the performance of public programs and policies, taking into account the extensive network of interactions between structures and sectors, including different spheres, powers, levels of government, and representatives of organized civil society;
- 3) Government Center Perspective, which deals with the direction that the government is able to give to the nation and its legitimacy before the stakeholders, creating the structural conditions for the administration and control of the State (BRASIL, 2021, n.p.).

Regardless of the perspective adopted, the principles of Public Governance must be observed, as they are fundamental elements for the construction of good practices in public management. For Teixeira and Gomes (2019, p. 526) "governance suggests the establishment of procedures and the corresponding execution, with the purpose of generating administrative efficiency to achieve results aligned between the agent and the main purpose" – society.

Thus, it is within the scope of the execution of the procedures that the principles of Public Governance are inserted.

Also, according to article 3 of Decree No. 9,203/2017, the principles of Public Governance: "I - responsiveness; II - integrity; III - reliability; IV - regulatory improvement; V - accountability and responsibility; and VI – transparency" (BRASIL, 2017).

It is noteworthy that, at the heart of the objectives of instituting the principles of Public Governance is the intention of the legislator to establish a connection between these principles and constitutional principles, keeping the performance of public managers centered on the citizen, for the faithful fulfillment of the mission of public management (BRASIL, 2018).

For the Federal Court of Auditors, the principles of Public Governance They are directly related to constitutional principles, expanding the normative meaning of the Constitution, "expanding their respective fields of interpretation", since:

In addition to efficiency, it is necessary to ensure responsiveness; publicity should incorporate transparency and accountability; There is no legality that can be detached from reliability. Another function of governance principles and guidelines is to serve as the main normative-prescriptive framework for the development of governance policy, delimiting the competencies of the actors and structures involved in its execution and coordination. In other words, the principles and guidelines represent the north of the policy (BRASIL, 2018, p. 38).

Such delimitation is what helps the conduction of public policies to meet social demands, guiding the improvements that can be promoted in the scope of governance, defining actions and

proposing solutions in decision-making centered on the social interest, as in the case of Public Governance focused on public health policies.

Based on what is proposed in article 198 of the Federal Constitution of 1988, it is clear that health actions and services are integrated through a regionalized and hierarchical network, thus constituting the Unified Health System (SUS), in which governance is established through a single organizational arrangement, however, composed of several institutions. whose purpose is to "operate strategic formulation and decision-making processes that organize and coordinate the interaction" of the entire system with a view to obtaining effective results for the population served (MENDES, 2011).

It is worth noting that for some time now, the term and/or governance actions have been applied by international health governance bodies, considering the need to present improvements in public policies in the area, aimed at more effective results, through management tools. As a result, the World Health Organization (WHO) defines that governance in the health sector:

[...] It refers to various governmental functions, carried out by governments and decision-makers, to achieve the objectives of the National Health Policy favorable to its universal coverage. It is a political process that involves balancing different influences and demands, for example, from users of health services, professionals in the area, suppliers of inputs and medicines (BRASIL, 2018, p. 21).

In the same vein, in 2007, the Pan American Health Organization (PAHO) presented health governance as a tool for the exercise of responsibilities and competencies of public health policies, where they are Governments and society (BRAZIL, 2018). Or This sharing of responsibilities is corroborated by the World Bank, considering that governance is based on instruments that encourage accountability as an essential means for the desired transformations in health services (WORLD BANK, 2007).

Still, considering the definitions of international bodies regarding health governance, it is necessary to highlight that the European WHO distinguishes between two terms: "health governance" and "health governance". The term "health governance" is used to designate the type of governance applied to strengthen health systems, such as the SUS, for example.

In short, the central points of health governance, from the perspective of international organizations, are strategic direction, monitoring, system articulation, coordination between the health sector and different health sectors, accountability, transparency, and the strengthening of incentives (BRASIL, 2018, p. 22).

On the other hand, the term "governance for health" is more comprehensive, that is, the joint involvement of all sectors that promote health directly and indirectly from public and private sectors, including society, aiming at the common interest (WHO EUROPE, 2012).

Specifically in Brazil, public health governance focuses on four perspectives of observation to be applied in the SUS, which are: (a) society and State; (b) federative entities, spheres of power and public policies; (c) bodies and entities; and (d) intra-organizational activities.

The observation perspective refers to the level of comprehensiveness that governance can be understood and evaluated, [since] the good relationship between the different perspectives is of high relevance for improving the performance of any area or policy (BRASIL, 2018, p. 23).

It is observed that the corporate aspect of governance in the public sector is the governance applicable to agencies and entities, whose focus is on organizations and the optimization of their results for citizens who use services, in this case, health services (BRASIL, 2018).

In Brazil, in the search for more effective solutions to the problems Related to health, since 2011, the federal government has instituted public governance practices in health, with the aim of developing and implementing strategies for the evaluation and monitoring of health services within the SUS, through which it would be possible to articulate and coordinate both the sector and the participating agents, including accountability, transparency and the strengthening of incentives through more efficient management (BRASIL, 2018).

In this context, the federal government proposes the creation of the National Program for the Improvement of Access and Quality of Primary Care (PMAQ-AB), based on access to and quality of health services, with the objective of promoting the expansion of access and improvement of the quality of Primary Care, with greater transparency and effectiveness of actions. according to the particularities of each location (BRASIL, 2015).

The present work seeks to reflect on how the PMAQ-AB, as a The program proposed by the federal government at the municipal level, if implemented ethically and responsibly, can contribute to public health governance actions and effective improvement of services.

OBJECTIVE

To report the experience of adhering to the PMAQ-AB in a small municipality in the south of Santa Catarina, expressing the benefits achieved and how much this proposal is articulated with the assumptions of public health governance.

PMAQ-AB AS A PUBLIC HEALTH GOVERNANCE TOOL FOR CARE MANAGEMENT IN THE TERRITORY OF THE FAMILY HEALTH STRATEGY

Based on the issues of public governance in health and the need to implement improvements in Primary Health Care services, this report proposes to present the PMAQ-AB program as a tool for

public governance in health, through the related theoretical foundations and considering the reality of implementation of the program in the municipality of Sombrio-SC.

To understand the process of adhesion to the aforementioned program and From the present report, we structured a theoretical reflection considering the concepts that are directly related to the theme. Thus, this report aims to present the SUS governance system at the municipal level, considering administrative structures, processes, instruments and information flows developed from the application of the PMAQ-AB.

For the purposes of this report, it is necessary to briefly describe the structural context of the Municipal Health Department in which the implementation of the program took place in Sombrio-SC, since it is a municipality with approximately 38,500 inhabitants, distributed in urban and rural areas registered in the local health system called Branet. Primary Health Care in the city is organized into nine (9) units with Family Health Strategy (FHS) teams, seven (07) Oral Health teams (OHT) and one (1) UBS, which meets the demand for specific medical services in the areas of pediatrics, gynecology and obstetrics of the 9 FHS. Also in this space, there are mental health outpatient services, immunization network, including vaccines for the first days of life, and heel prick test. They also perform electrocardiogram exams, colposcopy, cryocauterization, minor surgeries, teledermatology, outpatient nursing services, among other programs recommended by the Ministry of Health.

Together with the Municipal Health Department (SMS), in addition to its structure Administratively, there are also the services of control, evaluation and auditing, the Out of Home Treatment (TFD) sector, the Regulation System (SISREG), the transport/logistics sector, social service, Primary Care pharmacy, the Specialized Component of Pharmaceutical Assistance (CEAF), and some specialties, such as: physiotherapy, speech therapy and nutrition.

The family health strategy teams are located in the following neighborhoods: São José, Nova Brasília, Januária, São Luiz, Guarita, Boa Esperança, Parque das Avenidas and Centro. In this scenario, the implementation of the PMAQ AB program occurred with the aim of promoting improvements in the standards of primary health care services offered by the Municipality.

According to the Ministry of Health, the implementation of PMAQ AB, in order to In order to fulfill its purpose, it should be organized into "four phases that complement each other and that form a continuous cycle of improvement in access to and quality of Primary Care (PC)" (BRASIL, 2015, p. 6), comprising the following actions:

1. Adhesion of the municipality to the program and contracting of commitments signed between the Primary Care (PCt) teams, municipal managers and the Ministry of Health;

2. Development of actions aimed at the qualification of the work process of the teams and management, such as actions related to continuing education, institutional support, monitoring of indicators and self-assessment processes;
3. External evaluation, which seeks to verify the conditions of access and quality and to identify the efforts and results of PCt and managers in the qualification of PHC;
4. Recontracting, which leads the teams to renegotiation processes between the Primary Care teams and managers with the increase of new standards and quality indicators, stimulating the systematic advancement of the program (BRASIL, 2015, p. 6).

These actions have taken place so far in three cycles, the first cycle being between 2011 and 2012, with the adhesion of 3,965 Brazilian municipalities; the second cycle between 2013 and 2014, with 5,073 municipalities joining; and the third cycle between 2016 and 2018, with 5,324 municipalities, of which the municipality of Sombrio-SC, adherence to PMAQ AB took place during the second and third cycles, in all basic health units (BRASIL, 2018).

The fear of punitive evaluation of professionals justifies the non-adherence of the first cycle, being clear from the words of the nurse from one of the FHS in the municipality:

"The adhesion to the PMAQ in the second cycle in our municipality brought us a lot of questions and fears inherent in everyone's shallow knowledge of what the program was really about. The biggest challenge as a team coordinator was to try to remove the team's view that the evaluation had a punitive aspect, of negative judgment of our work" (Enfa. B.R.M).

In the view of Bertusso and Rizzotto (2018), the initial difficulty presented by the work teams in the municipality of Sombrio-SC may be related to the "little dialogue between the management team and PHC team workers", which constitutes a challenge to be overcome for the implementation of a public health policy that aims at effective improvements. This is because, according to the aforementioned authors:

Distancing from the process of discussion and formulation, and, in this case, adherence to the policy, makes it difficult to understand its objectives, does not contribute to the co-responsibility of the results, and consequently reduces the possibility of a positive impact on what is proposed (BERTUSSO and RIZZOTTO, 2018, p. 412).

According to the PMAQ AB institutionalization manual developed by the Ministry of Health, as a way of guiding the municipalities with the actions that must be adopted for the program to be effective, the adhesion process contemplates the adoption of changes on the most diverse fronts, both in the model of care and in the management of health services, where the development of teams is mainly sought, with a view to orienting the services according to the needs and satisfaction of users (BRASIL, 2015).

Among the main changes to be introduced for adherence to the PMAQAB are mainly the introduction of self-assessment methodologies for work teams and the implementation of continuing education practices (KAMIYAMA, 2016).

In this context, the role of the manager becomes fundamental, in the sense of consolidating the *modus operandi*, so that the team, together with the support of the management, is committed to the process of changing the management model that aims to meet the needs of users (AZEREDO, 2017).

As every process of change is laborious and delicate, when starting the activities necessary to fit the municipality of Sombrio-SC to the requirements of the program, the teams showed some resistance and even disbelief about the possibility of returns and benefits offered as a counterpart for the adequacy of the improvements made by the health services.

However, gradually, the actions were carried out and evaluated by the Ministry of Health. Among the main changes was the computerization of work processes, which was treated as a starting point for the institutionalization of PMAQ AB in the municipality, considering that the evaluation of the indicators would be based on the data entered in the computerized systems. As a result, the first measure to improve primary care in the city was the implementation of electronic medical records, allowing greater agility in accessing data from SUS users.

According to Velloso (2019), the implementation of electronic medical records allows the computerization and standardization of information about patients, which will provide subsidies to meet the health needs of the population at all levels of primary care, constituting the starting point for the implementation of the PMAQ-AB.

Little by little, the culture of developing the institutional capacity of the teams, focused on the analysis and evaluation of data for intervention in health services, became more effective. However, at the time, only two units were more engaged in the processes related to the program. Due to the commitment of the teams of the aforementioned units during the program's certification process, the classifications made by the Ministry of Health's external evaluations were reflected in scores in the "above average" category, as provided for in the ordinance that instituted the PMAQ AB.

The change generated in the organizational culture of the teams, in relation to the implementation of the PMAQ-AB in the municipality of Sombrio-SC reflects what Bertusso (2017, p. 7) states, that "positive changes are related to a better understanding of the PMAQ by the PHC teams". Such understanding, in turn, is related to the improvements made over the time of implementation, as well as to the organization and recording of the information generated by the teams in the area covered by the territory.

It should be noted that among the evaluated dimensions of improvements implemented were: the functioning of the health unit; structural characteristics of the UBS; equipment, materials and

supplies; computerization, connectivity, and telehealth; medicines Components of the Basic Pharmacy; qualification of the work team; acceptance of spontaneous demand; municipal management of health services, among others (BRASIL, 2015).

The range of classification as "above average" by such units The basic measures allowed the federal government to send resources, which resulted in the acquisition of a zero-kilometer vehicle to provide home health services, further raising the score of the size of the units mentioned with regard to the indicator "Home Visit and Home Care" (BRASIL, 2015).

As the resources began to be transferred to the municipality, enabling the improvements described, the other basic health units felt motivated to dedicate themselves to the program and its improvement actions.

Bearing in mind that the objective of PMAQ AB is to promote the implementation of a culture of negotiation and contractualization, which is reflected in the management of resources according to the commitments and results agreed and achieved (PINTO et al., 2014), 60% of the amounts received, due to the averages achieved by the teams of the first two UBS that stood out, started to be allocated to remuneration for performance to the members, with an increase of approximately R\$ 500.00 in the remuneration of each server, still in the second cycle of implementation of the program.

It should be noted that the purpose of performance pay is to The main one, "the recognition of the contribution and value added to the service by the professionals, through the distinction of different levels of results and their evaluation according to them" (UFMG, 2014, p. 09).

Specifically in Primary Care, remuneration for performance promoted by PMAQ AB, aims to:

[...] valuing all primary care workers by fostering the implementation of instruments for the democratization of work processes, with the possible linking of financial incentives or other forms of incentive related to performance, health outcomes, continuing education, and efforts for professional development (UFMG, 2014, p. 11).

The proposal for remuneration for performance brought by the PMAQ AB, if It is one of the main characteristics that presents the program as an instrument of public governance in health, whose central purpose is to offer improvements in health systems and services with a focus on the needs of citizens, considering that effective results of day-to-day practical actions are achieved through the involvement and accountability of the people who make up the work teams, which are inserted as co-participants in the management process in search of the effectiveness of the desired results, with regard to quality in local public health.

The remuneration for performance included in the program is a way to achieve the agreed goals and ensure a continuous process of improvement of health services, as experienced in the

experience of the municipality of Sombrio-SC, which with the financial incentives reverted to the local Primary Care itself, it was observed on the part of the employees who make up the teams a significant reduction in absences and presentation of medical certificates, in addition to greater involvement in the provision of services, as they felt motivated by the increase in remuneration.

The improvements in the performance of the teams that make up the municipal basic units occurred from the second to the third cycle of the PMAQ AB, when the UBS teams that were highlighted received an evaluation "well above average", considering the new improvements that were imposed and complied with. Currently, as of the AB financing ordinance - Ordinance 2.979/19, the PMAQ AB in the municipality of Sombrio-SC is suspended, however, the improvements made are maintained continuously.

Evidenced in a positive way in the following statements: "*The positive part was Precisely this clarification that the program came to add and was really a motivator for the team to come together in search of improvements and standardization of our services. We had a significant growth as a team, seeing all the good we did and what we should improve*" (Enfa. B.R.M).

The scenario described above shows what Flôres et al. (2018, p. 240), which:

[...] Financial resources can be an important motivational tool, showing that this method is more effective in specific actions and short-term changes, therefore, in more complex actions, which need frequent evaluations and efficient monitoring of actions. It is necessary for managers to develop a quality plan to improve the actions of the PMAQ-AB and the financial resource can be another motivator for professionals to perform an efficient work in the search for PHC qualification.

In the words of the institutional supporter (V.P.C): "*The PMAQ for the municipality of Sombrio brought many improvements, because through the incentives received we renovated and adapted with more accessibility, equipped, properly identified, according to the guidelines of the Ministry of Health, all the ESF units, making them more welcoming, harmonious, bringing well-being to patients and also to the employees who work in the units*". This demonstrates that, in their perception, the PMAQ-AB presents itself as an "important tool for evaluating health actions, capable of providing management with a critical look at them", in order to then develop and implement the necessary changes and improvements, focusing on the needs of the population served (FLÔRES, et al., 2018, p. 240).

The program brought, in addition to the improvements described, the search for quality Of assistance Provided nonetheless Presented from mode general discontinuity, being one of the negative milestones, because once again we are experiencing a government policy and not a state policy, so, with the change of government at the federal level, there was in 2020 the discontinuity of the ministerial program.

REFLECTIONS ON PMAQ-AB AS A TOOL FOR PUBLIC GOVERNANCE IN HEALTH

With the establishment of public health governance processes, whose In order to promote actions to improve health actions and services with a focus on the needs of citizens, the need for a new structuring of public policies until then developed by the SUS arose.

In this context, in 2011, the federal government proposed the creation of the National Program for the Improvement of Access and Quality of Primary Care (PMAQ-AB), based on access to and quality of health services, which guarantees coverage "with health promotion, prevention and recovery actions for more than 100 million Brazilians", including the adhesion of thousands of basic units throughout the country (BRASIL, 2015, p. 10). The central objective of the program was to

[...] to induce the expansion of access and the improvement of the quality of primary care, with the guarantee of a comparable quality standard nationally, regionally and locally, in order to allow greater transparency and effectiveness of government actions aimed at Primary Health Care (BRASIL, 2015, p. 11).

Although the main objective of PMAQ AB is to promote the expansion and the improvement of the quality of Primary Care, with greater transparency and effectiveness of health services, it should be mentioned that the program also aims, among its initiatives, to survey and evaluate indicators that qualify the SUS, which demonstrate the dimensions of the results of the health policy. This type of evaluation allows for a careful analysis of health systems, providing grounded support for decision-making, ensuring "the transparency of SUS management processes," which make the results achieved more visible, "in addition to strengthening social control and the health system's focus on users" (BRASIL, 2015, p. 12).

In this sense, the basic premises of PMAQ AB are: development strategies for user satisfaction; standardization of good practices that guide the improvement in the quality of Primary Care; effectiveness and efficiency of results in the health system; monitoring, evaluation and self-evaluation of processes, transparency, management and innovation (BRASIL, 2015).

All these criteria are part of the essence of public health governance, which, if implemented, promotes the improvement of the way of doing health in Primary Care, meeting the assumption of offering citizens the service appropriate to their needs (BRASIL, 2018).

For this reason, the federal government structured the design of the PMAQ AB based on seven guidelines, which serve as a guide for its implementation, organization and development in the municipalities. These guidelines offered the path to be followed by managers when adhering to and implementing the PMAQ AB, where there should be: a) specific parameters for comparisons between teams, in relation to regional differences; b) standardization of the work processes of the teams, involving management and permanent evaluation of results; c) permanent transparency mechanisms for monitoring the results both by the teams and by organized civil society; d)



accountability of managers, teams and users for actions to improve work processes in primary care; e) transfers of resources through the performance of the teams, thus recognizing the efforts of the municipal management; f) mobilization of teams for the development of strategies that reflect the improvement of actions with a view to the most effective results for citizens, inviting society to participate in this process; and , g) voluntary adherence by managers and teams that propose to implement improvements in primary care, following the guidelines proposed by the program and promoting a motivating environment, with remuneration for performance so that effective results are achieved, where teams will be rewarded for the success achieved (BRASIL, 2015).

Regarding the objectives established by the program, Pinto et al. (2014, p. 359) highlight important points that are mainly related to the introduction of changes in both the care and management models, as well as in relation to the "development of workers and orienting services according to the needs and satisfaction of users", including the mobilization of the various actors involved in primary care, through spaces for dialogue, problematization and change management, which will be reflected in the quality of the health services offered.

All the guidelines and criteria mentioned above, which give PMAQ AB the characteristics of a public health governance tool, were initially instituted through Ordinance GM/MS No. 1,654, of July 19, 2011, later revoked by Ordinance 1,645, of October 2, 2015, issued by the Ministry of Health. For the Ministry of Health (2015), the establishment of PMAQ AB is a strategy capable of inducing the necessary changes in the provision of health services in Primary Care.

In the view of Pinto et al. (2014), by instituting the PMAQ AB, the federal government through the Ministry of Health, glimpsed the possibility of implementing a new culture, that is,

[...] analysis, evaluation, and intervention capable of generating institutional capacity in local teams and systems to produce changes in service practices, according to the expected characteristics of Primary Care (PC) and locoregional potentialities (PINTO at al., 2014, p. 359).

As a result, the PMAQ AB came to be considered an innovation in the Primary Care Policy (PNAB), not only in terms of financing actions, but also because it integrates several processes into a single strategy, unfolding in phases that include the definition of objectives; development of actions to change the analyzed reality; planning of continuing education actions; evaluation of the implementation of processes and results, continuous improvement actions through the new commitments made after the evaluation process has been carried out (PINTO et al., 2014).

With the completion of these phases, the PMAQ AB is also a process of evaluation of the degree of implementation of other strategic areas and programs that involve the National Primary Care Policy. In this context, it should be noted that one of the most relevant activities proposed by the program was the remuneration for the performance of the teams, which occurs through the

evaluation of the implementation and/or development of the processes by the Primary Care teams, establishing desirable parameters of action in various types of health services offered, motivating them to act more effectively, being rewarded for a more effective performance, where everyone wins, that is, managers, teams and service users (PINTO et al., 2014).

Considering what was exposed by Pinto et al. (2014), the research carried out by Bertusso (2017, p.7), it was proven that "adherence to the PMAQ-AB, to a large extent, results from its link to the transfer of resources from the Federal Government to the municipalities, which represents an important contribution of resources to the AB", which is directly related to the involvement of the teams in the process of contracting the indicators.

Notwithstanding this fact, Bertusso and Rizzotto (2018, p. 408), in a study conducted in the state of Paraná on the perception of health teams that participated in the PMAQ-AB in the region, similarly to what occurred in the municipality of Sombrio-SC, state that the program presents itself as a public governance tool in health due to the results it provides regarding the "organization and recording of information; planning based on self-assessment and external evaluation as a strategy for mobilizing management and teams", which occurs through the appropriate use of self-assessment tools in conjunction with local planning.

Considering what Pinto et al. (2014) state, it is possible to characterize the PMAQ AB as a tool for public governance in health, considering that it is based on guidelines that highlight it as a mechanism for qualitative and quantitative changes in Primary Care processes, whose focus is the improvement of health services to society. that take place from participation actions; accountability of the actors involved; management and transparency; At the same time, it promotes motivation for remuneration for the performance of the teams, as a form of continuous action of proposed changes according to the reality of each location.

However, it is appropriate to highlight that among the changes and actions necessary for the PMAQ-AB to manifest itself as a public health governance tool for care management in the territory is the standardization of the services of the health teams, which includes the support of a co-participatory management, combined with the qualification of the members who compose it through mechanisms of permanent education and self-evaluation of the services provided to users. in order to promote their continuous improvement (KAMIYAMA, 2016).

In addition, in the field of government and public policy, Flôres et al. (2018) cite that the implementation of the PMAQ-AB in Brazilian municipalities depends, among the aspects mentioned, on quality public management, which is understood as a process of creating health policies and enabling their implementation, providing resources, supervising and evaluating all actions carried out in favor of the quality of public health services.



FINAL THOUGHTS

In the development of this experience report, concepts about public governance and public governance in health were initially addressed, where it was possible to highlight that such terms are reflected in the union of efforts between the directing function and the public policy management function, in this case health policies, which together have the central objective of establishing improvements in health services, with greater efficiency and focus on the needs of the citizen, adopting strategic actions based on principles of responsiveness; integrity; reliability; regulatory improvement; accountability and responsibility; transparency

Thus, considering the entire context of public governance in health, it is believed that the PMAQ AB, when implemented in the municipality of SombrioSC, proved to be an important tool for the institution of the principles of public governance, especially when it comes to the improvements provided at the local level, being possible to mention the computerization of work processes, which generated greater transparency and responsiveness to the citizen; the acquisition of the vehicle, which provided greater efficiency and agility in home care, also contemplating the responsiveness; and, mainly, the institution of remuneration for performance, which was characterized as an instrument of motivation, involvement and greater accountability of the teams in the processes of improvement not only in the work processes, but also for the effectiveness of local health services.


The initial resistance to change manifested itself as a challenge to be overcome, as well as other structural problems, whose studies are suggested as possibilities for new research, considering the changes brought about by the current Ordinance No. 2,979 of 2019, which institutes the Previner Brasil Program, with a new model of financing and costing of Primary Health Care within the scope of the SUS, Bringing the payment for performance based on the achievement of goals for each indicator conditioned to the teams.

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Exploratory thoracotomy and rib osteosynthesis in a canine: Case report

 <https://doi.org/10.56238/sevned2024.014-022>

Gabriel Satoru Ohashi¹, Wagner Costa Lima², Marcilene dos Santos Leal³, Fernanda Vieira Henrique⁴, Vanessa Milech⁵, Ilka Catarina de Santiago Cunha⁶, Dayanne Anunciação Silva Dantas Lima⁷ and Manoel Lopes da Silva Filho⁸

ABSTRACT

A thoracotomy is a surgical incision in the chest wall to access the thoracic cavity to correct various alterations, including fractures. In cases of rib fracture correction, osteosynthesis is usually performed. The aim of this study was to report the case of a thoracotomy followed by rib osteosynthesis in a canine. A one-year-old Shih-tzu female weighing 4 kg presented with respiratory difficulties and intense pain on chest palpation and movement, inappetence and a small circular lesion in the chest area, as well as depression of the affected area. The presumptive diagnosis was made by identifying the clinical signs, which were confirmed by exploratory thoracotomy. Pre-anesthetic medication was given with tramadol, anesthetic induction with propofol, followed by total intravenous anesthesia with propofol using a syringe infusion pump. Skin diuresis was performed at the level of the 4th intercostal space, identifying muscle tears and rib fractures. For fracture repair, the hemi-clamping technique using steel wire was recommended, as well as reduction of the intercostal muscles and myorrhaphy of the thoracic muscles, using a simple continuous suture pattern with size 2-0 polyglactin 910 thread. Reduction of dead space, in the subcutaneous region, in the Cushing pattern, with size 2-0 polyglactin 910 thread and dermorrhaphy in the Sultan pattern with 2-0 polypropylene thread. It can be concluded that steel wire osteosynthesis was effective in resolving the animal's thoracic trauma.

Keywords: Surgery, Rib fracture, Hemicerclage, Thoracic trauma.

¹ Graduate in Veterinary Medicine
Institution: Federal University of Piauí (UFPI)
E-mail: gabriel.satoru@hotmail.com

² Doctor in Animal Science
Institution: Federal University of Piauí (UFPI)
E-mail: wagnercl@ufpi.edu.br

³ Undergraduate student in Veterinary Medicine
Institution: Federal University of Piauí (UFPI)
E-mail: marcilenevet@gmail.com

⁴ Doctor in Animal Science and Health
Institution: Federal Rural University of Pernambuco (UFRPE)
E-mail: dra.fernandahenrique@ufpi.edu.br

⁵ Doctor in Veterinary Medicine
Institution: Federal University of Santa Maria
E-mail: vanessamilech@gmail.com

⁶ Specialist in Veterinary Clinical Pathology
Institution: Federal University of Piauí (UFPI)
E-mail: catarina.santiago@ufpi.edu.br

⁷ PhD in Animal Science
Institution: Federal University of Piauí (UFPI)
E-mail: dayanneasdl@ufpi.edu.br

⁸ Doctor of Veterinary Science
Institution: Federal University of Piauí (UFPI)
E-mail: manoellopes@ufpi.edu.br

INTRODUCTION

Several anatomical regions can be covered during a surgical procedure, one of them is the region of the thoracic cavity, which can be delimited as being long laterally with a greater proportion in the ventral dorsal portion, having as structural constitution the pairs of ribs, as well as costal cartilages, vertebrae and sternesbras. Among these, it is delimited that the first and last sternesbras are called manubrium and xiphoid cartilage (RAMPAZZO; FRIOLANI; CAMARGOS, 2013).

The intercostal muscles of the inner and outer regions make up the wall of the thorax, and these are delimited by the region between the ribs. It is noteworthy that the thoracic region is also associated with the dorsal and ventral serratus muscles, scalene, external abdominal oblique, latissimus dorsi and pectoral. All blood flow in this region is carried out through the intercostal arteries (NUNES, 2009).

Thoracotomy is a surgical incision in the chest wall, with the purpose of accessing the thoracic cavity to perform fracture corrections, correct cardiovascular changes, remove foreign bodies, collect samples, evaluate the evolution of diseases and, in specific cases, can be used as a definitive diagnostic method (exploratory thoracotomy) (PEREIRA *et al.*, 2016). According to the target organ within the thoracic cavity, the most efficient method of approach can be chosen, which is through the intercostal, lateral or sternal region (sternotomy) (SOUZA *et al.*, 2014).

In cases of rib fracture repairs, osteosynthesis is usually performed. In it, orthopedic steel wires are commonly used as cerclage or hemicerclage wires. Where they are traditionally used in association with other orthopaedic implants in order to provide greater bone stability (FREITAS *et al.*, 2017).

The cerclage wire is so named when the steel wire is placed around the bone circumference, it is usually used in long oblique or spiral fractures, which require stabilization of a large number of segments, and is not indicated for stabilization of short or transverse oblique fractures (PIMENTEL *et al.*, 2021). While the hemicerclage wire can be said to be a steel wire that is passed through holes drilled in the bone, it can be used in smaller fractures, which have a simple continuity solution and in small dogs and cats (FOSSUM, 2019).

Due to the anatomy and physiology involved in the thoracic region, any and all procedures performed in the thoracic region require great care in order to avoid damage to vital structures, pain and physiological changes. It is worth mentioning that this region is surrounded by negative pressure, which ensures the functioning of respiratory functions (CURTOLO, 2021). This justifies the importance of studies that report procedures performed on the chest, in order to provide a broader knowledge of the various forms of intervention for the treatment of conditions in this region.

In this context, the objective of this study was to report the case of a canine patient with rib fracture, submitted to exploratory thoracotomy and rib osteosynthesis, treated at the University

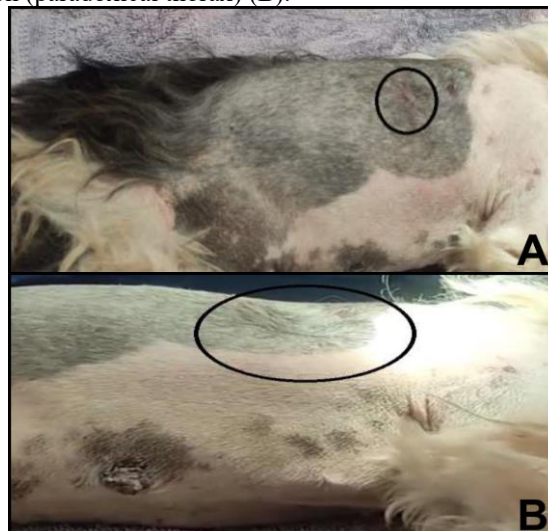
CASE REPORT

A one-year-old female Shih-tzu canine, weighing 4 kg, was treated at the HVU of UFPI/CPCE, located in the municipality of Bom Jesus – PI, on October 2, 2023, presenting respiratory difficulty. In the anamnesis, the owner reported that the dog had pain when moving, inappetence and suspected that someone had shot the animal with a pressure gun. It was also found that she did not have access to the street and only took walks accompanied. It is noteworthy that all vaccinations were up to date, as well as treatment for ectoparasites and endoparasites.

Then, the clinical and physical examination of the animal was performed. where the same presented Heart and respiratory rates of 148 bpm (beats per minute) and 36 mpm (movements per minute), respectively; rectal temperature of 37.7 °C; mucous membranes normocolored; capillary filling time (PCT) less than two seconds; degree of dehydration between 5 and 6 %; no noteworthy changes in the lymph nodes; and presence of a normokinetic pulse. Pulmonary auscultation revealed the presence of crackles on the side right, in the caudal pulmonary lobe, present mainly at the end of inspiration.

In addition, there was the presence of a circular lesion of approximately 0.5 cm in the middle third of the thorax, on the right side, with probable communication with the thoracic cavity (Figure 1-A). Palpation of the region revealed the presence of subcutaneous emphysema and pain. For a better visualization of the affected region, a broad trichotomy was performed. Thus, the presence of a bulging in the thoracic region was verified, which was more accentuated during inspiration, a clinical sign called paradoxical thorax (Figure 1-B).

Figure 1. Circular lesion in the cranial third of the thorax (circle) (A). Bulging (circle) in the thoracic region, which was more pronounced during inspiration (paradoxical thorax) (B).



Source: HVU, Bom Jesus – PI.

At the time, a blood count was requested for a better evaluation of the animal's general condition. The result of the complete blood count revealed normochromic macrocytic anemia, neutrophilia leukocytosis with deviation on the right, lymphopenia and thrombocytopenia, it should be noted that in the white series the presence of toxic neutrophils and Dohle corpuscles was observed. (Table 1).

Table 1. Values obtained from the preoperative blood count of a canine patient treated at the HVU – UFPI/CPCE presenting thoracic trauma.

Cbc	Values obtained	Reference values
Erythrocytes	3,3	5.5-8.5 x10 ⁶ /μL
Hemoglobin	8,8	12-18 g/dL
Haematocrit	27	37-55 %
VCM	81,8	60-77 fL
CHCM	31,6	31-36 g/dL
Leukogram	Values obtained	Reference values
Total Leukocytes	22.900	6,000-17,000 μL
Rods	Relative (%): 3% Absoluta (μL): 687 μL	Relative (%): 0-3% Absoluta (μL): 0-300 μL
Targeted	Relative (%): 90% Absoluta (μL): 20.610 μL	Relative: 60-77% Absoluta: 3.000–1.500μL
Lymphocytes	Relative (%): 2% Absoluta (μL): 458 μL	Relative: 12-30% Absoluta: 1.000-4.800μL
Platelet	Values obtained	Reference values
Platelets	102.000	200,000-500,000 μL

Source: HVU, Bom Jesus – PI. Reference values according to Weiss and Wardrop (2010).

After the evaluation of the exams and clinical signs presented by the animal, during the consultation, it was decided to perform an exploratory thoracotomy, in order to perform an evaluation of the possibly affected structures in the thoracic region, in addition to correcting them, if necessary. It is noteworthy that the radiographic examination was not performed due to the lack of availability of the radiographic examination in the region and in the HVU.

The animal was sent to the preoperative room, where the pre-anesthetic medication with tramadol was performed at a dose of 4 mg/kg intramuscularly (IM). In addition, venous access was established through catheter no. 22, and lactated ringer's fluid therapy was implemented at an infusion rate of 5 mL/kg/hour. It is noteworthy that a prophylactic antibiotic with enrofloxacin (5mg/kg) intravenous (IV) was used.

Subsequently, the patient was taken to the operating room, where anesthetic induction was performed with propofol, 4mg/kg, IV, followed by intubation with an orotracheal tube of n°. 4,5 and subsequently, the animal was kept under stage three and anesthetic plane three by means of total intravenous anesthesia (TIVA) with propofol in a syringe infusion pump, at a dose of 0.3 mg/kg/minute.

In addition, ketamine 1.2 mg/kg/hour and lidocaine 3 mg/kg/hour were also infused in separate infusion pumps. After opening the thoracic cavity, the patient's oxygenation was maintained

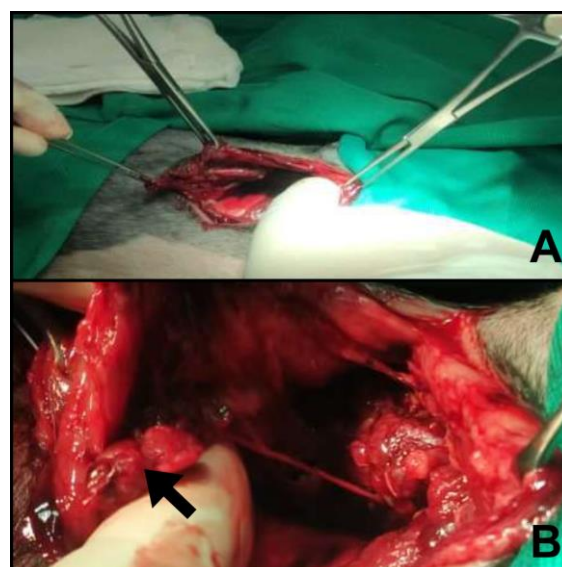
by means of manual ventilation (12 ventilations per minute), due to the unavailability of a mechanical ventilator. It was recommended to use intercostal blockade performed in the right lateral decubitus, following the margin of two intercostal spaces cranial and caudal to the lesion, and infiltrative block in the incision line, both were performed with lidocaine without vasoconstrictor at a dose of 5mg/kg.

Subsequently, the patient was placed in the left lateral decubitus position, thus performing prior and definitive antisepsis by means of degerming chlorhexidine the 2%. The field cloths were positioned and fixed with the aid of Backhaus tweezers. With the aid of a 23 scalpel blade, the skin was dieresis was performed, with approximately 10 centimeters at the level of the 4th intercostal space, after which the subcutaneous tissue was divulsed with the aid of Metzenbaum scissors with a blunt-fine tip to facilitate the visualization and exposure of the latissimus dorsi muscle. Skin and subcutaneous hemorrhages were contained by means of clamping and digital compression.

As a result, muscle lacerations and rib fractures were identified. Finally, in order to gain access to the cavity, the external and internal intercostal muscles were incited, widening the incision line with the aid of Metzenbaum scissors with a fine-blunt tip. At this point, the anesthesiologist was informed about the institution of positive pressure for the thoracic cavity, so that manual ventilation could be initiated.

With the aid of two Allis forceps, the intercostal muscle was clamped on both edges, and then the forceps were lightly tractioned to improve the visualization of the cavity (Figure 2a). After inspection of the region, it was found that the lung had not been affected, but three ribs were fractured (Figure 2b).

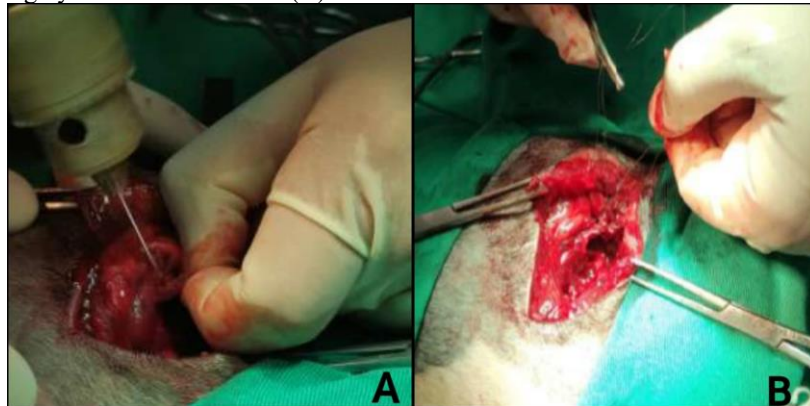
Figure 2. Clamping of the intercostal muscle for visualization of the thoracic cavity (A). Exposure of one of the fractured rib segments (arrow) (B).



Source: HVU, Bom Jesus – PI.

The fracture found in the ribs was of the simple, transverse, diaphyseal and closed complete type. For the correction of the fracture, the technique of hemicerclage by means of steel wire was recommended. Thus, the end of each segment of the fractured rib was drilled with the aid of an orthopedic drill, accompanied by a smooth 1.0 mm steel pin. The holes were used to pass through a 0.6 mm steel wire (Figure 3a) and be able to anchor all segments, in addition to bringing them closer together (Figure 3b), and the same procedure was performed in the three segments.

Figure 3. Perforation of one of the fractured segments of the rib to fix the steel wire (A). Hemicerclage made in the rib segments, after anchoring by means of steel wire (B).



Source: HVU, Bom Jesus – PI.

Subsequently, after stabilization of the fractured ribs, myorrhaphy of the intercostal and thoracic muscles was performed by means of the simple continuous suture pattern, in both cases the use of polyglactin 910 thread size 2-0 was recommended (Figure 3a). Dead space was reduced in the subcutaneous region in a Cushing pattern with 910 polyglactin thread size 2-0 (Figure 3b). Finally, 2-0 polypropylene thread was used for the dermorphaphy, which was done in the Sultan pattern (Figure 3-C).

Figure 3. Reduction of the intercostal space and myorrhaphy of the thoracic muscles (A). Reduction of dead space in the subcutaneous region (B). Sultan pattern dermorphaphy with polypropylene thread (C).



Source: HVU, Bom Jesus – PI.

After the procedure is over, ReinstatedThe negative pressure of the thoracic cavity was measured with the aid of a 10 mL syringe coupled to a three-way stopcock and a 23G scalp. Finally, the affected region was wrapped with a bandage with medium compression.

After the end of the surgery, the animal was sent to the anesthetic recovery room, where the physiological parameters were monitored until the patient was discharged. In the immediate postoperative period, dipyrene (25 mg/kg) was administered intramuscularly (IM) and meloxicam (0.1 mg/kg) were administered subcutaneously (SC). After the reestablishment Of all physiological parameters, considering the normal values for the species, the animal was discharged surgically, with a return after three days for removal of the bandage and reevaluation. It was recommended that the animal be hospitalized for constant monitoring during the first 24 hours.

For the immediate postoperative treatment, the following were prescribed: carprofen, 2.2mg/kg orally (PO), twice a day (BID), for four days; dipyrene, 25mg/kg, PO three times a day (TID), for seven days; tramadol 5 mg/kg, PO, TID, for five days; amoxicillin + potassium clavulanate, 25 mg/kg, PO, BID, for 12 days; and antibacterial ointment based on gentamicin, sulfanilamide, sulfadiazine, urea, and vitamin A palmitate, until total healing. In addition, it was recommended to wear surgical clothing 24 hours a day and to rest completely until the stitches were removed after 10 days.

According to the recommendation, after three days the animal returned for removal of the bandages and a new evaluation. The respiratory pattern was reestablished and without alterations, even after the removal of the bandages, all physiological parameters were evaluated and when pulmonary auscultation performed, the persistence of the crackle on the right side in the caudal pulmonary lobe at the end of expiration, and no other changes were found. The tutor reported the return of food intake and a higher level of activity by the patient. In view of the current inflammatory condition, prednisolone, 1 mg/kg, PO, BID, for ten days, and a nutritional supplement based on blood plasma, mannan oligosaccharide and beta-glucan, 3 g/day/once a day (SID) for thirty days, and a new evaluation was scheduled after ten days.

The patient returned for reassessment, in which no changes in physiological parameters were observed and pulmonary auscultation was unclear. The animal did not present pain on palpation of the thoracic region, and the thoracoabdominal breathing pattern was normal. The surgical wound was completely healed, so it was decided to remove the stitches.

DISCUSSION

An unstable chest, also known as a paradoxical chest, is seen when, now of inspiration, the fracture site becomes depressed, and at the moment of expiration, an expansion occurs. This fact was

observed in the animal treated during the physical examination, where the depression in the fracture region was accentuated on inspiration (CUNHA *et al.*, 2009).

Animals with chest trauma usually have difficulty breathing, requiring emergency stabilization, which may include oxygen delivery, thoracocentesis, and/or stabilization of the costal segments. In this case, the patient was stable (urgency) and it was not necessary to perform emergency stabilization as described (FOSSUM, 2019).

Inspiratory crepitus detected on pulmonary auscultation is correlated with detachment of the walls of small airways filled with fluid or mucus, and is associated with pulmonary edema (JASSNIKER *et al.*, 2023). Therefore, it can be said that the crepitus found in the pulmonary auscultation at the end of the animal's inspiration converges with what has been described in the literature.

Chest injuries can be associated with fights, car accidents, firearms, and falls. Cases arising from fights are common in the clinical routine and may present circular perforation points due to penetration of the canine tooth (CUNHA *et al.*, 2009). In this case, there was also the presence of a perforation in the chest detected on physical examination, which presented characteristics of biting and not of being shot by a pressure gun, as reported by the tutor.

It is observed that leukocytosis due to neutrophilia with a right shift, described in this case, may correspond to an excess of cortisol (chronic stress), since cortisol has an anti-inflammatory effect preventing the exit of leukocytes from the vessel, providing a hypersegmentation of neutrophils, consistent with what was described by Portas *et al.* (2022).

Trettene *et al.* (2020), reports that opioids are widely used as pre-anesthetic medication because they provide efficient analgesia. In this case, the use of tramadol for pre-anesthetic medication provided a reduction in discomfort and moderate analgesia for the surgical procedure.

Müller *et al.* (2014) describes that intercostal nerve blockade when performed in two cranial and caudal intercostal spaces of the incision site has high analgesic efficiency in the transoperative and postoperative periods. Consistent with the recommended blockade for this case.

As described by Nelson and Couto (2015), the definitive diagnosis of a rib fracture is commonly made through radiographic examination, which allows the precise visualization of bone structures, however, in the absence of it, exploratory thoracotomy can be used as a diagnostic method, despite being highly invasive, it proved to be efficient for the diagnosis of this case.

Cases of exploratory thoracotomy with an intercostal surgical approach are efficient if the affected area is limited to only the left or right side (FOSSUM, 2019). In this case, the right lateral intercostal surgical approach provided adequate exposure of the three fractures present, thus allowing adequate correction and stabilization of the segments by means of the steel wire.

Thoracotomy with rib resection generates greater exposure when compared to intercostal thoracotomy, making it more difficult to obtain a safe closure of the region and longer postoperative recovery time, and is not recommended in cases with pre-existing rib fractures because it provides greater surgical stimulation (FOSSUM, 2019). According to the report, it is verified that the surgical approach chosen is consistent with that recommended by the literature.

According to Flores *et al.* (2022), depending on the exposure required and the pathological process established, intercostal thoracotomy with lateral access can be said to be a standard approach for the thoracic cavity in most cases in small animals. This proved to be efficient for the present case, providing adequate exposure for the visualization of fractures.

According to Minto and Dias (2022), the use of hemicerclage may be convenient in cases where the fracture has a simple solution of continuity, has a transverse direction, and the animal is small. Therefore, in this case, the surgical approach is consistent with what has been described in the literature, since the characteristics of the fracture were consistent with the use of the stabilization technique by means of hemicerclage.

According to Maritato, Colón and Kergosien (2009), after the opening of the thoracic cavity, the negative pressure is lost and, as a result, there is a loss of autonomic respiratory function due to the intake of air. Therefore, the negative pressure was restored at the end of the surgery, using a syringe coupled to a three-way stopcock and a scalp for complete removal of air in the thoracic cavity.

The use of compressive bandage with medium compression in the postoperative period of thoracic surgeries is essential for an adequate recovery of the patient, limiting respiratory movements in the first weeks, promoting better healing and ossification (FARO, 2008). In the present report, the use of compressive bandages proved to be efficient for the containment of the dead space, ensuring greater stability of the affected site, consistent with what has been described.

Bif (2022) mentions that the continuous infusion of lidocaine and ketamine acts crucially in analgesia, in addition, ketamine acts by reducing pain and the requirement of opioids in the postoperative period, so the clinical and therapeutic approaches adopted were efficient to ensure efficient analgesia to the patient.

The immediate postoperative period for surgeries with thoracic approaches requires the use of analgesics and anti-inflammatories, due to the exacerbated stimuli caused during surgery (FRAGATA, 2008). Thus, the use of tramadol for moderate pain control and carprofen as a non-steroidal anti-inflammatory drug for the control of the inflammatory process and as an adjuvant for pain control were recommended.

Ribeiro (2019) describes that amoxicillin associated with potassium clavulanate is an important broad-spectrum antibiotic used in clinical routine in cases of infections by gram-negative



and positive bacteria, being the drug of choice in less severe cases. Therefore, in cases of opportunistic infections, as observed in this report, amoxicillin proved to be efficient in containing and eliminating the infection.

Prednisolone is a steroidal anti-inflammatory drug that has an anti-inflammatory and immunosuppressive effect, it inhibits the initial and late manifestations of inflammation, but delays healing, so it should be used with caution in cases of wounds (GORENSTEIN *et al.*, 2019). In this case, its use proved to be necessary due to the persistence of the inflammatory process in the pulmonary region detected in the surgical follow-up by means of pulmonary auscultation with the presence of crackles, showing that the carprofen prescribed for the immediate postoperative period was not efficient in controlling the inflammatory process triggered.

CONCLUSION

It can be concluded that the surgical technique used was efficient for the resolution of the animal's thoracic trauma, providing adequate postoperative recovery.


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Spectrophotometric investigation of natural dyes of *Portulaca grandiflora* and *Catharanthus roseus* flowers

 <https://doi.org/10.56238/sevened2024.014-023>

Vitória Rocha de Oliveira¹ and Fred Augusto Ribeiro Nogueira²

ABSTRACT

The study of dyes of native flowers contributes to a better investigation of these species, which can motivate new economic activities in the country. The objective of this work was to characterize by spectrophotometry the natural dyes extracted from the petals of the flowers *Portulaca grandiflora* and *Catharanthus roseus*. The extraction of the dyes was carried out by maceration of the petals of the dried flowers and under different experimental conditions to evaluate the extraction time and the type of solvent used. The dyes obtained were characterized by spectrophotometry in the UV/Visible region to evaluate the spectroscopic behavior and the maximum absorbance lengths of each flower. The extractions of the dyes from the flowers were effective in the experimental conditions evaluated, but with spectroscopic profiles showing bands in different regions and with varying intensities. The study of the spectrophotometric behavior of these flowers can help in their use as an alternative source of natural dyes.

Keywords: Natural dyes, *Portulaca grandiflora*, *Catharanthus roseus*, Spectrophotometry.

¹ Graduated in chemistry
Federal University of Alagoas
vitoria.oliveira@iqb.ufal.br

² Doctor of Science
Federal Institute of Alagoas
fred.nogueira@ifal.edu.br

INTRODUCTION

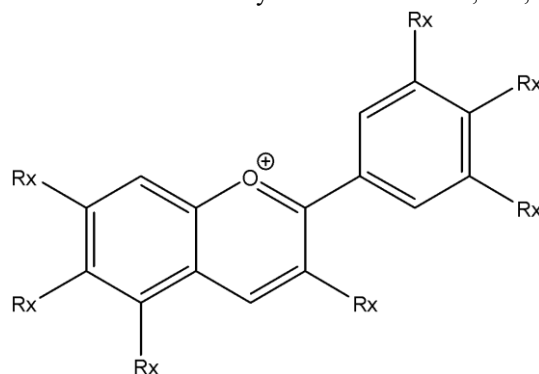
Natural dyes have been a part of human history since ancient times. Whether in cultural, artistic and/or religious manifestations, such as dyeing the body or dyeing the hair, a very common practice among indigenous peoples and which has become part of the cultural identity of these native peoples. In artistic and/or religious manifestations, cave paintings are rescued, showing that humanity searched, in its environment, for products and substances of flora to obtain color patterns for the most diverse purposes (Dias *et al.*, 2016; Granados-Balbuena *et al.*, 2024). In addition, natural dyes have been used since ancient times to dye materials such as wool, leather, silk, carpets and cotton, regardless of their origin (plants, animals or minerals) (Ebrahimi; Gheshlagh; Parham, 2024).

The use of non-allergenic, non-toxic and eco-friendly natural dyes has taken a prominent position nowadays due to the growing environmental awareness, with the aim of avoiding the dangers associated with synthetic dye sources (Ebrahimi; Gheshlagh; Parham, 2024). The vast majority of natural dye raw materials are dye plants. The roots, stems, twigs, and flowers or whole parts of certain plants are used in natural dyeing (Karadag, 2023).

These natural dyes are responsible for a wide range of colors in plants, they produce these colors through biochemical routes and utilize them to attract pollinators, protect against predators, and ultraviolet light. Natural plant pigments are divided into four main groups: carotenoids, chlorophylls, betalains, and flavonoids (Granados-Balbuena *et al.*, 2024; Kaewprachu *et al.*, 2024). Among the flavonoids, anthocyanins (Figure 1) are the most important floral pigments for the types of applications proposed in this work and are responsible for a wide spectrum of possible colors in flowers and fruits, including light yellow, scarlet, red, magenta, violet, and blue (Wang *et al.*, 2023).

The interest in developing anthocyanin-based products has grown, mainly due to their nutritional attributes, coloring power, water solubility (which facilitates their incorporation into aqueous systems) and beneficial health effects promoted by them through various mechanisms of action, including antioxidant capacity (Almeida *et al.*, 2015). Anthocyanins are primarily applied as a coloring in food, but they also have the potential to dye other products such as textile substrates, cotton, leather, silk, and human hair. In the food industry, anthocyanins can be used as pigments in products such as curds, fermented milk, low-pH beverages, wines, and solid matrices such as pancakes and omelettes (de Araújo *et al.*, 2021).

Figure 1. Basic structure of anthocyanins. Rx can be H, OH, and COOH.



Fonte: DIAS et al., 2016.

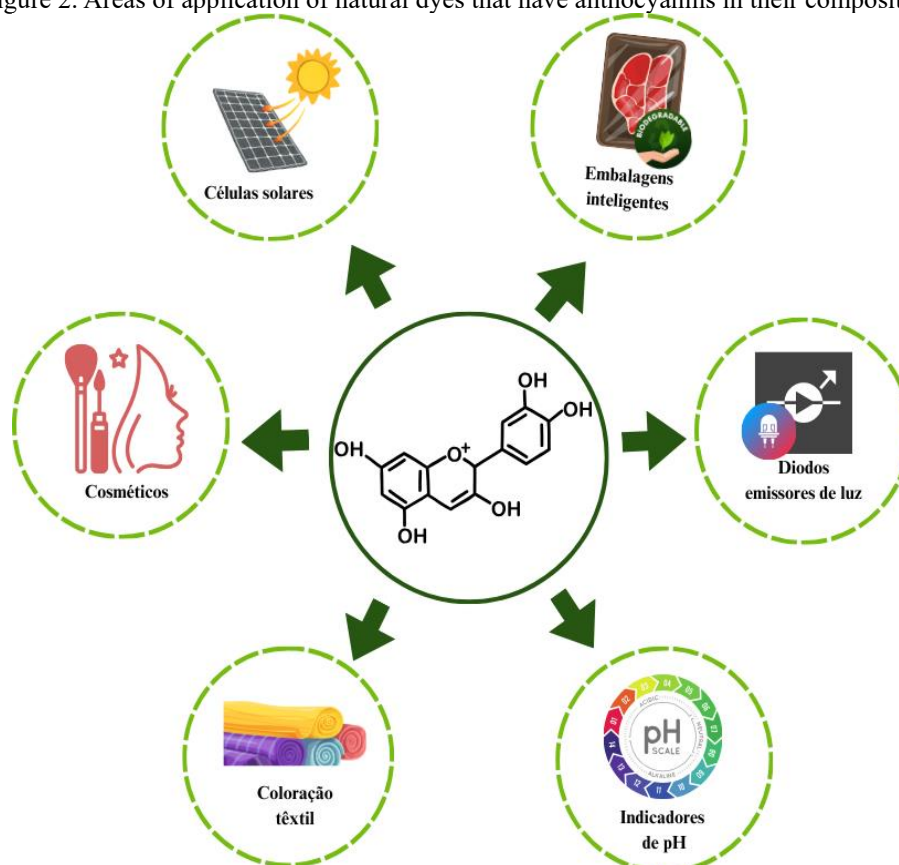
The study of native flower dyes contributes to a better investigation of these species, which may motivate new scientific discoveries. Thus, the present work aims to evaluate the best experimental conditions and characterize, by spectrophotometry in the ultraviolet to visible region, the natural dyes extracted from *Catharanthus roseus* and *Portulaca grandiflora* flowers found in the wild region of the state of Alagoas in order to evaluate the potential applicability of these dyes.

THEORETICAL FRAMEWORK

Natural dyes, obtained from plants, insects/animals and minerals, are products of renewable and sustainable biological resources, with minimal environmental impact and known since ancient times for their use (Shahid; Shahid-ul-Islam; Mohammad, 2013).

Complete biodegradation, non-toxicity and low cost are the advantages of using natural dyes for applications in various areas (Figure 2), such as in the production of organic devices such as dye-sensitized solar cells (Erdoğdu *et al.*, 2024; Mahajan *et al.*, 2024), smart packaging (Paschoa, 2016; Sheibani *et al.*, 2024), LEDs (Ohtani; Kitagawa; Matsuda, 2011) textile coloring (Sheibani *et al.*, 2024), pH indicators (Zhao *et al.*, 2024), food ingredients (Dweck, 2002), cosmetics (Portes *et al.*, 2024) among several other applications.

Figure 2. Areas of application of natural dyes that have anthocyanins in their composition.



Source: Prepared by the authors, 2024.

Anthocyanins are natural plant pigments of the flavonoid family, giving the colorful appearance (red, blue, and purple colors) of fruits, vegetables, and other foods (de Araújo *et al.*, 2021). They have properties that help maintain healthy eating habits that are demonstrated by anticarcinogenic, antiviral and antioxidant activities (Almeida *et al.*, 2015). This activity is due to its chemical structure formed by three rings, which have conjugated double bonds and hydroxyls distributed throughout the structure that enable the sequestration of free radicals, which cause cell damage and degenerative diseases (Bordignon *et al.*, 2009; da Silva *et al.*, 2007). Preclinical trials have reported the action of anthocyanins against some pathologies such as cancer, inflammation, cardiovascular diseases and obesity (de Araújo *et al.*, 2021; Saulite *et al.*, 2019; Thilavech *et al.*, 2018).

The greatest difficulty currently encountered in the use of anthocyanins as natural dyes is related to the instability of this flavonoid, since the color of the solutions depends on a series of factors such as the type of solvent used, pH, temperature, concentration, pigment structure and the presence of substances capable of reacting with anthocyanin (Phan *et al.*, 2021; Rossi *et al.*, 2022). In addition, the processes used during extraction strongly influence the stability of these compounds (Remini *et al.*, 2018).

Rossi *et al.*, (2022) reviewed the main problems found in the literature in the stability of

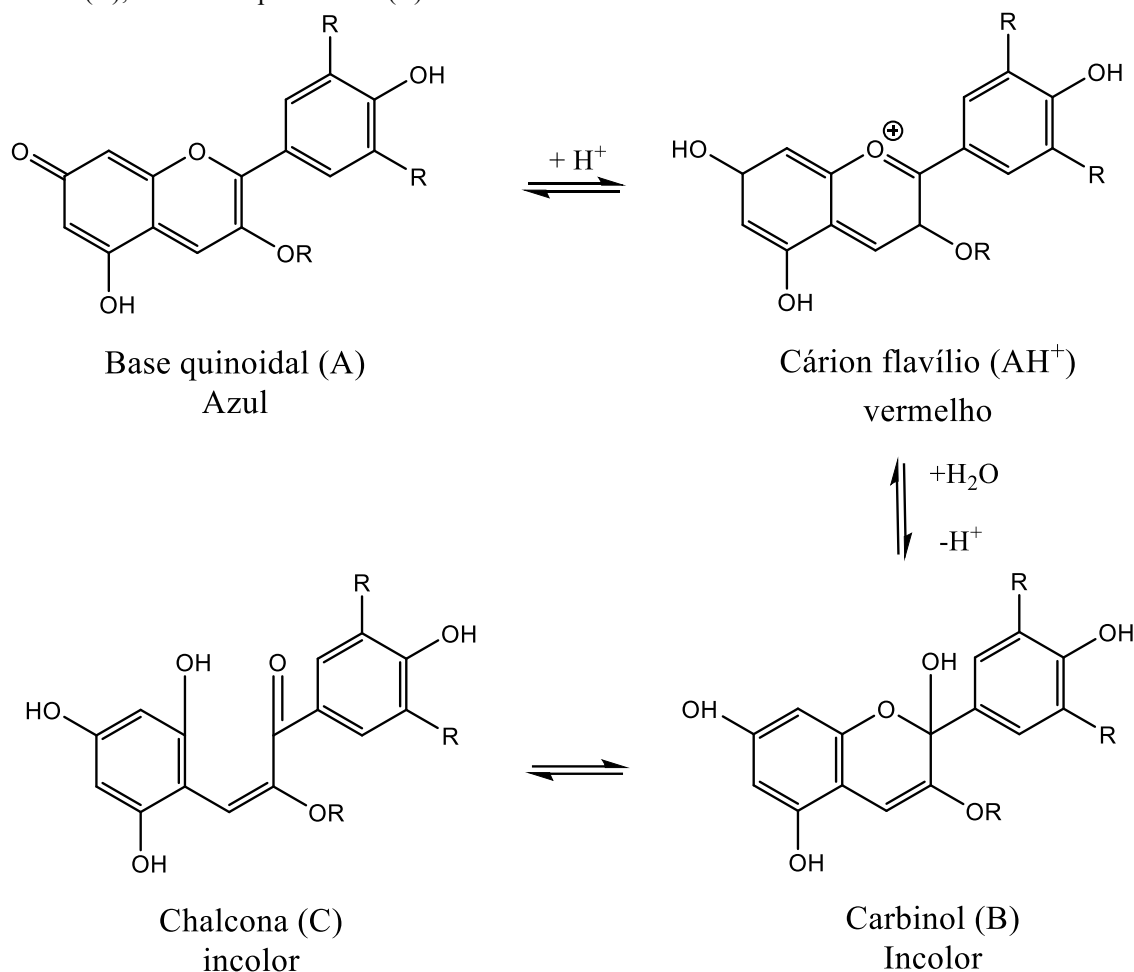
anthocyanins present in açai fruit, where the difficulty of ensuring the stability of anthocyanins, which modify and degrade under the influence of the pH of the medium, the temperature that is submitted in the processing stages, and exposure to light, was evidenced.

Regarding pH, Bordignon et al, (2019) evaluated the influence of the pH of the extractive solution on the anthocyanin content in strawberry fruits, verifying that the spectroscopic profile of the extracts varied according to the pH used in the extraction and found that the extraction of anthocyanins was more efficient at pH 1.0 values.

Anthocyanin extraction methods play a key role in obtaining dyes from various sources of plants, fruits, and flowers for use in a variety of applications. These methods are key to harnessing the diversity of colors found in nature and converting them into usable materials for various industries, including textiles, art, and renewable energy technologies (Mahajan *et al.*, 2024).

Absorption spectroscopy in the UV-Vis region is a technique used to characterize the properties of natural dyes, providing essential information about the presence and content of anthocyanins in the dye. This method involves measuring the absorption of light by the dye solution across a spectrum of wavelengths, offering a comprehensive view of the dye's interaction with incident light. The obtained absorption spectrum reveals the specific wavelengths of light that the dye effectively absorbs (Mahajan *et al.*, 2024). Anthocyanins can have different structural forms, which can take on different colors (Bordignon *et al.*, 2009). Data from the literature indicate that four main chemical structures may occur in equilibrium: the flavillium cation (HA⁺), the quinoidal base (A), the pseudobase carbinol (B) and the chalcone (C) (Figure 3). March and Scarminio (2007) reported in studies with vinegar blossoms (*Hibiscus acetosella W.*) that, according to the pH variation, there is a change in the maximum absorption in the UV-visible spectrum (Bordignon *et al.*, 2009; Levi *et al.*, 2004; March; Scarminio, 2007).

Figure 3. Structures of anthocyanins found in aqueous solution with different pH values. Flavilium cation (AH^+), quinoidal base (A); carbinol or pseudobase (B) and chalcone ©.



Source: adapted from HE; GIUSTI, (2010).

Marpaung and Paramaputri (2023) studied the spectrophotometric variations of butterfly pea flower (*Clitoria ternatea L.*). At pH 1 values, the absorption spectrum exhibited two absorption bands under a UV-visible spectrophotometer, at ± 265 nm, and the second band has at ± 520 nm. The absorbance at 520 nm belongs to the AH^+ flavillium cation, i.e. the only species that exists at pH 1. At pH values > 5 , the band at ± 520 nm changes to 550 - 580 nm (purple quinonoid base, A) or 600 - 620 nm (blue anionic quinonoidal base, A^-).

Colorful flowers can also be a source of natural dyes (Mandal; Venkatramani, 2023). The flower of *Catharanthus roseus*, commonly known as goodnight, is grown as an ornamental flowering plant. The flowers have color variations (white, purple, peach, pink, scarlet, and red) (Kandiah; Chandrasekaran, 2021). *Catharanthus roseus* has medicinal effects, being a valuable source of antitumor agents, such as vinblastine and vincristine, used in the chemotherapy of leukemia and in the treatment of Hodgkin's disease (Piovan; Filippini, 2007). The flower of *Portulaca grandiflora* is a small herbaceous annual plant, commonly known as eleven o'clock, having several colors (white, red, purple, orange and pink). There are reports in the literature that extracts of this plant can be used as natural sources of antioxidants (Lim; Tiong; Loo, 2014).

In recent decades, many publications have reported the improvement of knowledge about plant dyes, but the benefits and potential applicability of the flower dyes highlighted in this study are still small and limited. A study of the spectrophotometric behavior may aid in the use of these flowers as an alternative source of natural dyes in the future.

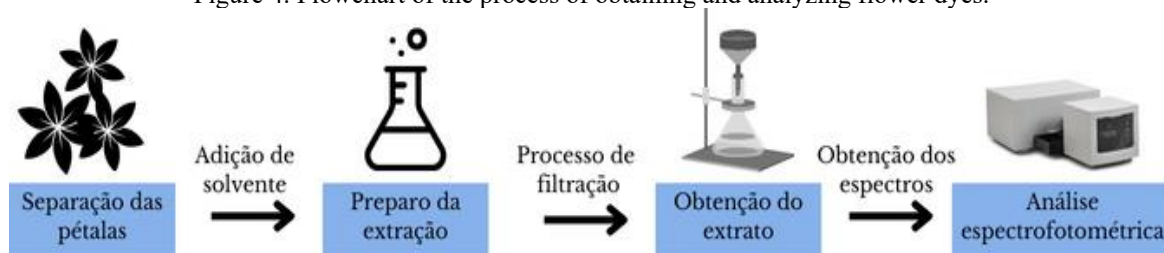
METHODOLOGY

The flowers were collected from garden houses in the city of Arapiraca, Alagoas. After collection, the flowers were washed, dried and then the petals were separated to be used.

To obtain the dyes of the flower petals, extracts with a concentration of 25% mass/volume were prepared under different experimental conditions, in order to verify in which condition the extracted dye presents the best performance. The solvents used for the extraction of the dyes were: ethanol (95%) (pH = 4.5) and acidified ethanol with 0.1 mol/L hydrochloric acid solution (pH = 2). The dyes were obtained with the flower petals at room temperature using dried petals in an oven at 60 °C for 1 hour. In the extraction process, the flower petals were immersed in the solvent for 48 h, under agitation, where aliquots were removed 24 and 48 hours after the beginning of the process (Figure 4).

The dyes obtained were filtered in a simple system and the solutions were stored in amber vials, to avoid degradation by the action of light, and kept under refrigeration. The dyes were characterized by spectrophotometry in the UV-Visible region (300 to 800 nm) on a SHIMADZU MultiSpec-1501 spectrophotometer to evaluate the maximum absorbance lengths of each flower.

Figure 4. Flowchart of the process of obtaining and analyzing flower dyes.



Source: Prepared by the authors, 2024.

RESULTS

The choice of flowers *Portulaca grandiflora* (eleven o'clock) and *Catharanthus roseus* (good night) (Figure 5) was made considering the fact that they are easily obtained in the northeastern region of Brazil, and because they have a color that indicates the probable presence of anthocyanins in their composition.

Figure 5. Photo of the flowers *Catharanthus roseus* (A) and *Portulaca grandiflora* (B).



The



B

Source: Prepared by the authors, 2024.

In the literature, several authors describe that dyes containing anthocyanins have a broad spectrum of absorption in the visible region and that their peak absorption is between 500 and 550 nm (Cabrera *et al.*, 2017; Sponsorship; Iha, 2010; Sampaio; Feitosa, 2016). Thus, through spectroscopy analyses in the UV-visible region, it is possible to obtain the maximum absorbances and their respective wavelengths, showing if a given dye has anthocyanins in its composition.

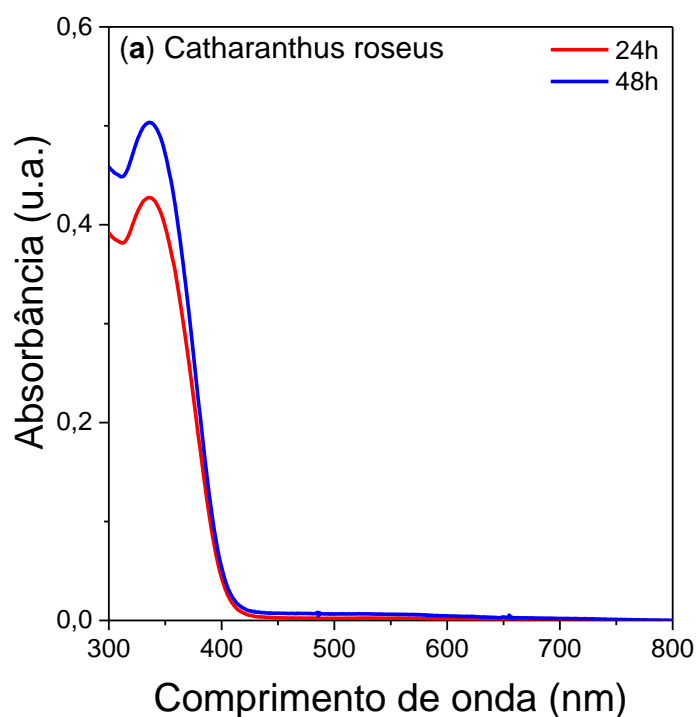
The spectroscopic profile of the dyes of the flowers of *Portulaca grandiflora* and *Catharanthus roseus* showed bands in different regions and with varying intensities, according to the extraction conditions, extraction time and plant evaluated (Table 1).

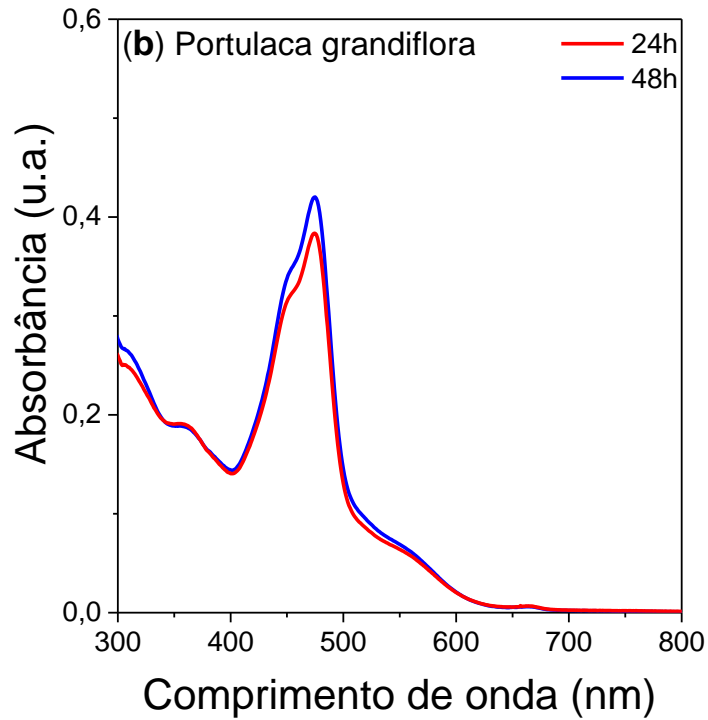
Figure 6 shows the absorption spectra of the dyes obtained from the petals of the flowers *Catharanthus roseus* (Figure 6a) and *Portulaca grandiflora* (Figure 6b) using ethanol as extraction solvent (pH 4.5) at extraction times of 24 h (red line) and 48 h (blue line). The flower dye *Catharanthus roseus* showed a single absorption band at 337 nm and a 15% increase in the absorption of this band when the extraction period was increased from 24h to 48h. On the other hand, the flower dye *Portulaca grandiflora* showed two absorption bands at 360 and 475 nm and an 8% increase in the absorption of the band at 475 nm. when the extraction time increased from 24 hours to 48 hours. The flower dyes *Catharanthus roseus* and *Portulaca grandiflora*, extracted in ethanol, did not present absorption bands characteristic of anthocyanins, since they do not have absorption bands at wavelengths between 500 and 550 nm (Feitosa; Shah; Cavalcante, 2016; Marpaung; Paramaputri, 2023).

Figure 7 shows the absorption spectra of flower dyes *Catharanthus roseus* (Figure 7a) and *Purslane grandiflora* (Figure 7b) using HCl-acidified ethanol as extraction solvent (pH 2) at 24 and 48h extraction times. Extraction of dyes with acidified ethanol revealed changes in the spectrophotometric behavior of the flower *Catharanthus roseus* with two bands at 347 and 536 nm,

and the flower *Portulaca grandiflora* with three bands at 381, 483 and 527 nm, compared to extraction with the solvent ethanol alone. Marpaung and Paramaputri (2023) reported that some anthocyanins, including ternatins, exhibit distinct characteristics by showing three bands in the visible region. The three bands represent all the colorful species of anthocyanins and that The bands present in dyes in the range between 500 to 550 nm are characteristic of anthocyanins and belong to the flavillium cation (Feitosa; Shah; Cavalcante, 2016; Marpaung; Paramaputri, 2023), which may indicate that the dyes obtained in acidified ethanol have these substances in their composition, however the flower dye *Portulaca grandiflora* (Figure 6b) shows the best behavior, as it presented absorption bands in the anthocyanin region with higher intensities than the flower *Catharanthus roseus*.

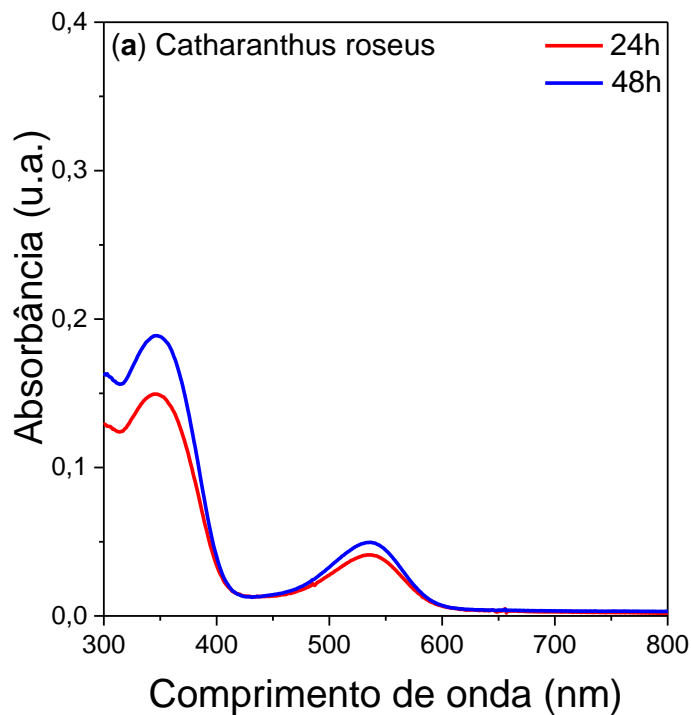
Figure 6. Absorption spectra of flower dyes *Catharanthus roseus* (a) and *Portulaca grandiflora* (b) extracted with ethanol at 24 and 48 hours.

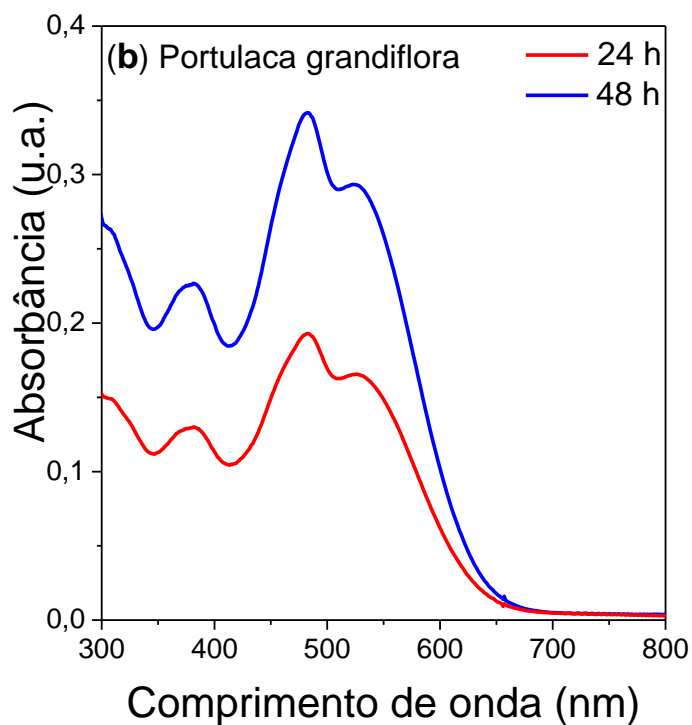




Source: Prepared by the authors, 2024.

Figure 7. Absorption spectra of flower dyes *Catharanthus roseus* (a) and *Portulaca grandiflora* (b) extracted with ethanol-HCl in 24 and 48 hours.





Source: Prepared by the authors, 2024.

In the comparison of the solvents used in the extraction of the dyes, it is possible to verify that the position and intensity of the bands varied according to the solvent used. According to the literature, for a better extraction of anthocyanins, the pH of the solution should be in the range of 2 to 3.5, since they are stable at acidic pH (Cabrera *et al.*, 2017). Wongcharee, Meeyoo and Chavadej (2007) conducted a study where anthocyanin dyes were extracted with different pH values. They studied the rosella pigment and found that at pH = 1 there was a higher efficiency of the dyes than at pH = 3. One reason for this increase in efficiency is that for pH values less than 2, anthocyanin exists in its stable form as a flavylium ion. Regarding the extraction time, it is favorable to work with the dyes obtained with a time of 48 h, due to the increase in the extracted material proven by the increase in the intensity of absorbance (Wongcharee; Meeyoo; Chavadej, 2007).

Table 1. Comparison of the wavelengths of the maximum absorbance peaks for each solvent.

Solvent	Flower Name	λ_{picos} (nm)
Ethanol	<i>Catharanthus roseus</i>	336
	<i>Purslane grandiflora</i>	475
Ethanol: HCl	<i>Catharanthus roseus</i>	346 & 535
	<i>Purslane grandiflora</i>	378, 481 e 528

Source: Prepared by the authors, 2024.

CONCLUSIONS

The extractions of the dyes from the flowers were effective in the experimental conditions evaluated, but with spectroscopic profiles showing bands in different regions and with varying intensities. A more in-depth study of the spectrophotometric behavior of these flowers may help in their use as an alternative source of natural dyes in several areas of knowledge.


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The use of technology in family farming food production: Evolution and popular knowledge

 <https://doi.org/10.56238/sevned2024.014-024>

Luan Xavier Santos¹, Claudino Anacleto de Andrade Neto², Mayria Rufino Sarmiento³, Waleska Cristina de Oliveira Pinto⁴ and Francisco Eudes Almeida da Costa⁵

ABSTRACT

Ethnoknowledge is a concept related to the knowledge, knowledge and cultural traditions of family farming. In this context, with the emergence of the Green Revolution, there were some obstacles to the development of subsistence agriculture with innovations in technology for food production and commercialization. In emphasis, this research aims to draw conclusions about the role of technology in family farming and its impact on the Brazilian rural economy, based on a synthesis of the results obtained from the literature review. With advances in technology, small producers are experiencing difficulties in the field, which in turn are unable to produce food on a long scale. The effect of the green revolution allowed the intensive use of pesticides, agricultural machinery, genetic improvement of seeds and other purposes that favored advances in technology in agriculture. However, with these advances, the role of agricultural production technology has caused greater complexity in agricultural activities in the field with improvements in quality, quantity, food security, economy and labor. The advancement of technology caused the lack of progress in food production in family farming, with low production and devaluation in the market. In short, it is worth highlighting that the importance of ethnoknowledge for family farmers is based on recovering cultures and traditions of original peoples, emphasizing techniques and instruments that are passed on from generations to generations, such as ancestors that are used in everyday life, experiences and knowledge transmitted. from father to children.

Keywords: Innovation, Ethnoknowledge, Subsistence agriculture.

¹ Master's student in Management in Agroindustrial Systems, PPGGSA, UFCG, Federal University of Campina de Grande.
E-mail: luanxaviersantos123@gmail.com

² Master's student in Management in Agroindustrial Systems, PPGGSA, UFCG, Federal University and Campina Grande
E-mail: claudinoneto7@gmail.com

³ Master's student in Tropical Horticulture, PPGHT, UFCG, Federal University of Campina Grande
E-mail: mayriasarmiento3443@gmail.com

⁴ Master's student in Agroindustrial Systems Management, PPGGSA, UFCG, Federal University of Campina Grande
E-mail: waleskacristyna@hotmail.com

⁵ Master's student in Management in Agroindustrial Systems, PPGGSA, UFCG
E-mail: francisco.eudessb@gmail.com



INTRODUCTION

Family farming is a type of agriculture in which the landowner and his family are responsible for planting and producing food. What is harvested is used to support the family, while the surplus is often sold to neighbors or at small local markets. According to data from the 2017 Agricultural Census, carried out by IBGE, 77% of Brazilian rural establishments are classified as family farming, totaling around 3.9 million establishments.

Despite the significant presence of areas classified as family farming, responsible for 77% of Brazilian rural establishments, this modality contributes only 23% of all agricultural production in the country, due to its emphasis on traditional practices and the absence of modern technology. However, it is an important source of employment and income in rural areas.

The techniques used in family farming are predominantly based on knowledge transmitted orally over generations, based on community experience and practical learning. According to Mendonça et al., (2013), “the family continues to be the basis for the formation of rural young people, as it is mainly from learning within the family that they consider themselves qualified to carry out agricultural activities”. Although these practices have evolved over time, especially after the Green Revolution that began in the 1960s, the implementation of technological advances is slow, mainly benefiting large producers.

According to Matos (2010), the Green Revolution introduced systematic studies and application of technologies in agricultural production. However, in Brazil, technological advances in agriculture have been more significant in the 20th and 21st centuries, propelling the country to a prominent position in global food production. However, family farming producers face difficulties in keeping up with this pace due to the lack of access to information and technology, as well as limitations in education and financial resources.

The development of agroindustry contributes significantly to the primary sector of the Brazilian economy, reflecting the effective application of technology and industrial organization. However, it contrasts with the slow progress of family producers, highlighting structural and socioeconomic challenges.

Therefore, this study aims to analyze the impact of technology on Brazilian family farming and its implications for the economic and social development of rural areas. To achieve this purpose, a comprehensive literature review will be conducted, exploring the historical evolution of family farming, the effects of the Green Revolution and the role of technology in agricultural production in Brazil.

Subsequently, the main challenges faced by family producers and opportunities for their development will be identified, including incentive policies and technical training. Therefore, the

objective of the research aims to draw conclusions about the role of technology in family farming and its impact on the Brazilian rural economy, based on a synthesis of the results obtained.

METHODOLOGY

The literature review plays a crucial role in conducting scientific research, providing a solid theoretical basis and contextualizing the problem investigated within the existing body of knowledge. According to Vieira (2012, p. 30):

The literature review or bibliographic review is the task of finding elements, through citations, that reinforce the arguments about the elements that will be used to test the hypotheses. In short, they will also contribute to the foundation of the argument.

Within the bibliographic review, it was decided to carry out a narrative review, an approach that involves a descriptive and interpretative analysis of the relevant literature on the research topic. According to Rother (2007), “narrative review articles are broad publications, appropriate for describing and discussing the development or “state of the art” of a given subject, from a theoretical point of view”. Thus, through this approach, the researcher seeks to identify patterns, trends and gaps in existing knowledge, providing a comprehensive and contextualized view of the field of study.

THEORETICAL FRAMEWORK

EVOLUTION OF AGRICULTURE AND FAMILY FARMING

Agriculture is an ancient activity that has enabled the development and construction of cities over the years. In the past, men were considered nomads, that is, they did not live in a fixed place, they basically lived in social groups and constantly changed territories in search of food for the group they were part of. However, according to Arieira (2017, p.20) “the discovery that discarded seeds gave rise, in a later period, to new plants, was the starting point for a unique revolution in the development of society and civilization”.

In this sense, the first civilizations began to emerge close to rivers and other water tributaries, which were suitable places for sowing and harvesting food from the land. It is worth noting that this process was not immediate, but was increased over several generations, year after year, until it reached the level of maturity it currently finds. Over time, a natural selection was made of the best production techniques, the best seeds, which adapt to each type of soil, and the best types of climate for each plant culture.

The development of agriculture was one of the main instruments for the development of humanity, if not the most important. Currently there are several international and national companies that are responsible for a large part of the planet's food supply, however, even in this competitive



market scenario the role of family farming is unquestionable, as its potential goes beyond food production.

Family farming has its own characteristics that distinguish it among various ways of working the land. In addition to its economic and social characteristics, family farming also stands out for the preservation and transmission of traditional knowledge. This knowledge, accumulated over generations, is fundamental for the sustainable management of natural resources and for adaptation to local climate, soil and biodiversity conditions.

Ethnoknowledge arising from experience associated with land management has information that transcends the most diverse techniques used in planting; this cultural wealth acquired through the transport of generations finds, in subsistence, one of the determining factors for choosing this way of life (RIBEIRO, MELO, BARROS, 2016, p. 564).

In this way, the traditional knowledge of family farmers encompasses agricultural, medicinal, culinary and cultural techniques, contributing not only to food production, but also to the conservation of biodiversity and the strengthening of the cultural identity of rural communities.

Family farming in Brazil is divided by Schneider (2014) into three distinct phases. The first phase, between 1990 and 1995, which began after the end of the military dictatorship, saw a resumption of the role of the union movement in promoting and defending the interests of family farmers. This period marks the resurgence of social mobilization in rural areas and the strengthening of the struggle for agrarian reform and the valorization of family farming as a pillar of the national economy.

In the second phase, which runs from 1996, with the advent of the National Program for Strengthening Family Farming (PRONAF), until 2006, there is a growing protagonism of mediators and intellectuals, especially social scientists, in the debate on family farming in the Brazil. Through studies, research and academic publications, these actors gave greater visibility to the need for public policies aimed at the growth and strengthening of family farming in Brazil. As a result, it is possible to mention the creation of the Food Acquisition Program (PAA), in 2004, and the improvement of the National School Meal Program (PNAE).

However, a significant milestone for family farming in Brazil in the second phase was the promulgation of Law 11,326, which became known as the Family Farming Law. This legislation provided several advances for the sector, including the 2006 Agricultural Census, which segmented agricultural establishments into family and non-family establishments, enabling a more detailed and precise knowledge of the characteristics of family units in Brazilian agriculture.

This legislation was extremely important as it brought definitions and concepts that characterize and distinguish family farmers, which subsequently facilitated access to credit and public policies for these farmers. As provided in its art. 3rd,

For the purposes of this Law, a family farmer and rural family entrepreneur is considered to be someone who carries out activities in rural areas, simultaneously meeting the following requirements:

- a) does not hold, in any capacity, an area larger than 4 (four) fiscal modules;
- b) predominantly use the family's own labor in the economic activities of their establishment or enterprise;
- c) have a minimum percentage of family income originating from the economic activities of your establishment;
- d) run your establishment with your family.

The third phase of family farming in Brazil began with the publication of the 2006 Agricultural Census Special Notebook, on September 30, 2009, and has continued to the present day. This event triggered an intense debate about the role of family farming in the country's rural development.

When approaching the different phases of the debate on family farming in Brazil, the complexity and relevance of this topic for the country's rural development becomes evident. The clash between different social actors, such as unions, research institutions and government organizations, reveals the different perspectives and interests involved in the discussion about the future of family farming. In this context, recognizing the role of ethnoknowledge in family farming emerges as a crucial element to understand and value traditional agricultural practices and local knowledge that have supported food production over time.

This idea is defended by Menezes (2019, p. 44), when he says that:

This knowledge combined with social interaction relationships of proximity and kinship makes the social organization of work in rural areas a unique form that brings together individual and collective characteristics simultaneously. The subjectivity contained in the affirmations of belonging and care for the land and others is one of the main characteristics that differentiates the type of economy and social organization of work in the community.

It is important to highlight that family farming cannot be understood solely from an economic or technical perspective. It is essential to recognize the importance of traditional knowledge and cultural practices that are transmitted from generation to generation in rural communities. According to Castro (1997), the knowledge and management methods adopted by traditional communities also play a crucial role in the conservation of biodiversity. Menezes (2019, p. 85) adds that:

In the midst of major global transformations, these populations preserve their history, their religion, their rites, their medicine (healing methods), their own economy of culture and life. They give new meaning to their material and symbolic way of life, even though they are constantly marginalized by the means of development of the dominant economic power.

Thus, ethnoknowledge in family farming not only contributes to the preservation of biodiversity and local ecosystems, but also strengthens the cultural identity and resilience of communities in the face of socioeconomic and environmental challenges.

Therefore, when observing the history of agriculture, especially family farming in Brazil, it is essential to promote policies and practices that value and encourage the sustainable use of ethnoknowledge. This implies not only recognizing the diversity of knowledge and practices that exist in rural communities, but also creating support and protection mechanisms to guarantee the continuity of this knowledge over time. By doing so, we can contribute to strengthening family farming as a model of sustainable and resilient food production, capable of promoting rural development and food security in Brazil.

THE EFFECTS OF THE GREEN REVOLUTION

The Green Revolution emerged in the 1960s and 1970s in the middle of the 20th century, in the construction of parameters, advances and development in agricultural production systems, with an emphasis on the search for improvements in agriculture through the evolution of technology (Matos, 2011). In this sense, it is considered that the Green Revolution is a process that involves agrarian politics and economy that achieved productive intensification through massive uses of mechanization, irrigation systems, intensive use of pesticides and genetic improvements (Martins; Moretto, 2023).

The advancement of the Green Revolution in the world was affected by problems arising from hunger, which led to the perception of low food productivity in some specific countries. However, after the growth of hunger, the “technological package” was adopted with advances in the modernization of agriculture around the world (Munerato et al., 2023). In Brazil, the Green Revolution led to global leadership in the production, exploration and expansion of food. Along with the creation of agricultural credit bodies that allowed farmers and rural producers to pay for agricultural productivity in harvests (Nogueira et al., 2023).

According to Arruda et al., (2023) the Green Revolution provided family farming with a subsistence compared to the way carried out by extensive agriculture, which ensures that small producers do not advance in the job market, making it difficult for family farmers to follow the productivist means- technology in the agricultural field. Amid the expansion of extensive agriculture, the justification evaluates humanity's food and nutritional security.

According to Santana et al., (2023) family farming is a practice inherited from generations to generations from parents to children seeking to prevail the cultural resistance of knowledge of the man of the land. Rural farmers normalize and advocate the concepts of sustainable agriculture and biodiverse agroecosystems, raising the methodological foundation of agroecological parameters.

With these advances of the Green Revolution in the face of technology in agriculture 4.0, it provides progressions related to aspects of improving field production in the use of inputs, machinery, seeds with genetic improvement, greater precision, lower productivity costs and shorter

time of hand availability of work. However, the increase in extensive agriculture has advantages and disadvantages when related to environmental impacts (Dias et al., 2023).

In this regard, the modernization of agriculture related to the Green Revolution demonstrates some disadvantages in terms of purposes and the environment. Because, producers who do not use these technological standards become disproportionate to those who do not use technological advances. Above all, in addition to the lack of standardization in the countryside and in rural areas, the indiscriminate use of pesticides, revolutionized by the Green Revolution in a paradigm with agricultural machinery for spraying such as: drones, aerial application and grasshoppers (Campanhola et al., 2022).

THE ROLE OF TECHNOLOGY IN AGRICULTURAL PRODUCTION

The expansion of technology in agricultural production was developed from the growing demand for food. Being a key factor in ensuring improvements in quantity and quality in food production (Lesão et al., 2021). On the other hand, the development of technology in agricultural production intensified the management of complexity in field activities with factors related to the conditions between innovation, agriculture and territory, favoring qualified labor for rural producers (Mesquita, 2022).

Given this scenario, the Brazilian agribusiness sector suffers from advances in new technologies, facing major challenges and critical issues which, in turn, are related to land expansion, deforestation and greenhouse gas emissions that involve the management of agriculture. 4.0 (Quintam; Assunção. 2023). Amid challenges, technology is also seen as crucial for innovative solutions that reinforce the importance of agricultural production (Portal et al., 2023).

Sausen et al., (2021) argues that the use of technology for food production should be adopted by rural producers. With this technology, it can be seen that monitoring sensors and artificial intelligence offer guarantees in the development of agricultural food production. Above all, agriculture 4.0 brings essential tools and techniques for production, generation and quality assurance in food productivity.

Goffi et al., (2017) discussed that the use of technologies in soybean production makes an increase in production evident, generating the viability of growth in new production areas and consequently, providing an increase in cultivated areas. With these field technologies, studies and research have shown an increase in the Brazilian economy in recent years with the generation of income and jobs in the field.

The evolution of technology in agricultural production encompasses advanced aspects in relation to food security. Previously, the literature states that there were quantitative and qualitative losses in the reduction and quality of food. In this sense, advanced technologies provide innovative



packaging, refrigerated transport and the use of storage systems that minimize the loss of food quality (Pimentel et al., 2024).

In accordance with the evolution of technologies in general, there will always be advantages and disadvantages when it comes to innovations. Therefore, technological advancement in areas of agricultural production must follow some concepts and processes such as: knowledge of production, decisions, forms of implementation and consider ways in which technology can benefit productivity, labor, cost, in the economy and the job market (Santos et al., 2024).

CONCLUSION

Ethnoknowledge is one of the fundamental pillars for the evolution of techniques used today by rural producers within family farming. When working in the field, methods, techniques and instruments that are cultural to a people are used. Popular knowledge can be understood as the transfer of ancestral knowledge that is used daily in the way of living and working, in coexistence and in kinship ties. This way, younger people carefully observe and follow the stages of work, allowing the technique to be passed on from generation to generation.

The use of techniques arising from popular knowledge prevails over technology when comparing their insertion in the production of these properties. However, this fact does not eliminate the use of innovation mechanisms by these communities. It appears that studies have shown that family farming has low rates of use of the main technologies, with significant regional heterogeneity regarding the use of certain practices and inputs. Therefore, the factors that hinder technological advancement in subsistence agriculture include the scarcity of financial resources, lack of technical assistance, insufficient credit policies and the small space of properties, which prevents the increase in production and the obtaining of a considerable profit to be reinvested in the development of the activity.




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The influence of public policies on municipal management of solid waste recycling: A systematic review

 <https://doi.org/10.56238/sevned2024.014-025>

Nathália de Jesus Vieira Silva¹ and Emerson Gervásio de Almeida²

ABSTRACT

This systematic study of the literature aims to demonstrate the state of the art regarding the productions of the administrative niche that deals with environmental public policies and solid waste recycling management. From the systematization, it is possible to delineate the collection on the theme that in recent decades has been treated with more recurrence due to the historical context of consumption and unbridled disposal. This theme, which is problematic in this review, allows us to reflect on the need for effective actions to mitigate the environmental impacts of urban solid waste, arising from uncontrolled production and disposal. Public policies, actions that promote sustainability practices, enable the public-private relationship in order to provide national organizations with the opportunity to promote the proper recycling of their waste, generating profitability from consumption and/or assisting with the correct disposal, becoming an active part in the process of mitigating damage to the environment. Formalized through the National Solid Waste Policy (PNRS), published in 2010, the actions that aim at a balanced environment, such as selective collection and recycling, were systematized in this legislative plan where the importance of the adoption by municipalities of sustainable actions regarding discarded solid waste is emphasized. The PNRS, when achieved, provides benefits as a whole, since it is the balanced environment that provides raw material for moving the economy, and it is necessary to reduce the volumes sent to landfills, extinguish irregular deposition, valorization and reinsertion of waste in the production chain, reduce the need to use natural resources and other measures proposed by this Policy; which must be applied from sustainable municipal management.

Keywords: Solid Waste Recycling, Public Policies, Municipal Management, National Solid Waste Policy.

¹ Bachelor of Laws, Master's student in the Graduate Program in Organizational Management at the Federal University of Catalão (UFCAT), Catalão, Goiás, Brazil

E-mail: nathaliadejesusvieira@gmail.com

² Bachelor of Law, Post-Graduate in Public Law, Master and Doctor in Geography (Area of Planning and Management of Urban Space). Professor in the Graduate Program in Organizational Management at the Federal University of Catalão (UFCAT), Catalão, Goiás, Brazil

E-mail: emersongervasio@ufcat.edu.br



INTRODUCTION

The ideal of sustainable municipal management should never be disregarded, for this the need to play our role as citizens who are concerned with sustainable development and a balanced environment, which can be achieved by the power we attribute to the State, since, as provided for in the Constitution of the Federative Republic of Brazil (CRFB), in its first article, by which all power emanates from the people, who exercise it through elected representatives or directly, under the terms of the aforementioned Constitution. In order to guarantee the right to an ecologically balanced environment, one of the measures within the environmental governance process is the recycling of solid waste that the government offers, either directly or in private partnerships.

One of the most serious problems today, when thinking about municipal solid waste management, is the unbridled production of products, which are always discarded, but not always recycled. This unbridled consumption and disposal is also seen as a market strategy, but the price of this economic management is paid with the degradation of the environment. This waste strategy is based on the turnover of production from the increase in the pace of demand, where a certain product is consumed faster and faster, thus having to replace it (ROSSINI, NASPOLINI. 2017).

The United Nations (UN), a relevant international organization, was founded in 1945 to mediate world relations across borders, harmonize the action of nations in the face of common objectives, act for common world development and ensure peace. This organization has instituted as a goal of the Sustainable Development Goals (SDGs) of the UN 2030 Agenda¹³, actions that make this attitude of production rotation unfeasible, discouraging unbridled consumption and consequently making countries adopt a robust management of the problem of solid waste recycling.

In short, this mentality of compulsive buying and disposing is unsustainable, as it drives production, increases the generation of post-consumer solid waste and contributes to the increase in greenhouse gas emissions, which cause drastic climate change (ROSSINI, NASPOLINI. 2017).

It is essential, therefore, to understand the important relationship between the legal scope and the public policies to be carried out by each nation, in view of the intervention of the judiciary in the conformation or application of these public policies. Law also plays a role in shaping the institutions that drive, design, and carry out public policies. It is relevant to theorize this relationship in this way, because it is on the Law that the institutional framework on which a policy operates is based, that is, it is the combination and communication, provided for in the rules, between legislative power; government, through political leadership; and Public Administration, constituting the bureaucratic structure. (BUCCI, 2006, p. 37).

Having highlighted the importance of governance regarding municipal solid waste, it is up to the context to study what are the research productions of this management niche about the problem, which is presented in this production.

CONTEXTUALIZATION OF THE WORK

This article arose from a study that is addressing solid waste recycling in the context of public policy and governance.

The increase in the world's population and the speed with which purchasing power has expanded, combined with advertisements that induce overconsumption and easy online purchase, has resulted in an exponential growth in solid waste stocks worldwide. In Brazil, considering the approval of the regulatory framework that instituted the PNRS, more than ten years ago, recycling practices, reverse logistics, and the level of environmental awareness of the population are still reduced. It is also observed at the municipal level that local legislation and collection networks are not yet well established, despite the fact that in theory there are already adequate technical solutions for an ecologically balanced environment.

It is up to the Public Administration, directly or indirectly through concessions, to govern solid waste recycling services.

There is complexity in the governance of Brazilian cities, it needs to be qualified and, above all, to understand the constituted interests, which are capable of interfering in all stages of the cycle of "public policies". (FONSECA, 2016)

Based on the principle of impersonality, one of those that govern public administration, it is ensured that public administration must serve all citizens, without any type of privilege or discrimination, a challenge that is applied in the context of recycling, since economic niches must be ensured to all, not prioritizing large urban centers and leaving small cities at the mercy of open air dumps or other unhealthy mechanisms for a balanced environment.

In this way, the supposed "unanimity" of "public policies", since it would aim at the aforementioned "common good", conceals, in the so-called "cycle of public policies", its conflictive character regarding the interests in dispute and the vetoes, by different means, coming from social groups that feel, real or imagined, harmed. Such conflicts can take on connotations of a clash of social classes, even though conceptualizing classes and their clashes implies a new analytical effort. (FONSECA, 2016).

In view of this finding, there was an evident need to carry out a systematic review of the literature to investigate the scientific production related to the management of solid waste recycling, at the national level, directed to the electronic collection of the National Association of Graduate Studies and Research in Administration (ANPAD), which has a repository of varied scientific articles.

METHOD

The present work consists of a study by means of a systematic review, with a total or partial qualitative approach, on environmental public policies. This form of research uses the investigation

where a specific question is first formulated to guide the search of the 14 publications, and in this study the research question: "What is the influence of public policies on the municipal management of solid waste?". It seeks to generate knowledge in order to later practical application to solve specific problems that involve interests and truths of a given locality (GERHARDT AND SILVEIRA, 2009).

The period of the search for publications that triggered this study took place in the second week of July 2023, including the articles resulting from the search with publications from all years, as long as the content was not incompatible with the exclusion criteria.

The researcher, through the literature review, will reach who has already written about the theme, what has already been published, what aspects have been addressed and also questions to be asked about the present object of research. From this it will achieve better justification, foundation and definition of the research theme (FONTENELLES, 2009).

The present systematic review was carried out based on a search in an electronic database, using keywords related to the research.

The search was restricted to the website of the National Association of Graduate Studies and Research in Administration (ANPAD), in the field of the SPELL electronic library. The choice of this event was due to its national scope, also enabling the participation of researchers from different teaching and research institutions.

The field selected for the search for the chosen keywords was "abstract". In addition, it was sought to consider the publications that were duly identified as authors, thus respecting their rights.

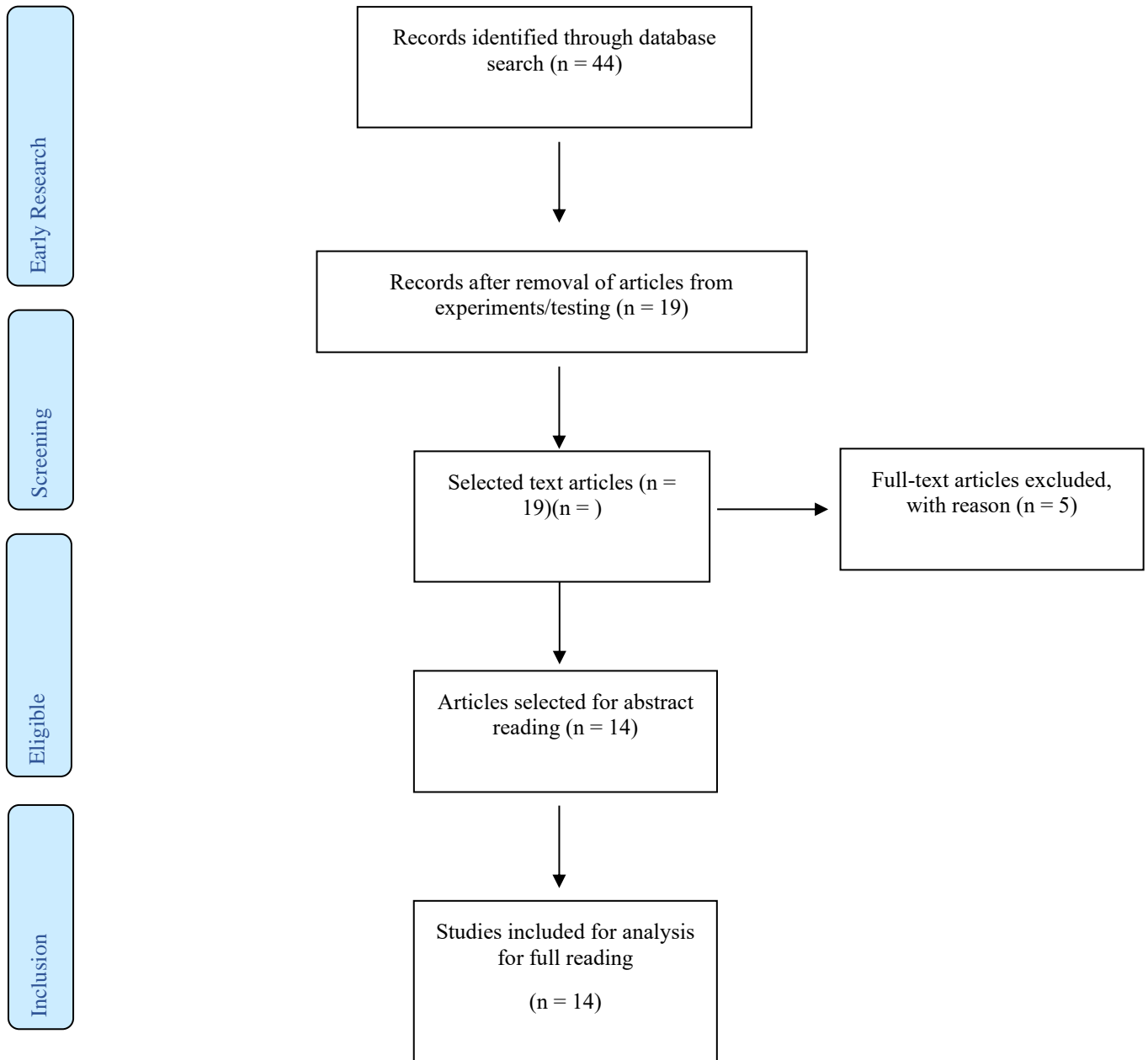
Finally, the abstracts and later full texts were read, the selected publications were filed, as well as a tabulation was prepared for the organization of this selection. Regarding the search design, the keywords "solid waste recycling" were used in the abstract field as mentioned, which resulted in 44 published articles. The methodology and instrument were used as an exclusion criterion, the experiment/testing studies were disregarded, a number of 25 articles excluded in this parameter, considering that this research will not take into account the experimental nature of recyclable solid materials, but rather the aspects involving the environmental public policy that falls on the management of these recyclable solid materials. In addition, articles that were outside the context of the theme were excluded, a number of 5 articles excluded in this criterion, which did not add to the context of the analysis of the influence of public policies on the municipal management of solid waste recycling.

After going through the steps described, 14 articles remained for analysis.

On the following page, through the PRISMA flowchart, the path taken for the selection of the articles systematized in this review is described, the number initially reached, articles removed from the exclusion and inclusion criteria described in the methodology.



Image 01. Prism Flowchart
PRISMA 2009 Flow Diagram



Source: Prepared by the authors.

RESULTS AND DISCUSSIONS

In this topic, the results and discussions of the data collected by the research will be presented. The selected articles, according to the methodology already presented, are arranged in detail in Chart 1 in terms of author(s), title and country, chronologically ordered in descending order. It can also be observed that most of the fourteen selected works originated from research carried out by two or more authors, and in this collection only two works came from individual research.

The various themes that start from the subject of Solid Waste Recycling, as well as the incidence of the theme of public management from public policies in these works, show the excessive influence of municipal management to achieve a balanced environment in common.

Image 02. Systematization of the information of the selected works

No.	Author/Details	Title	Summary
1	Almeida; Silveira; Engel (2020).	Collection and recycling of urban solid waste: contribution to the Debate Environmental Sustainability.	The importance of working on environmental awareness in the selective collection of solid waste is emphasized, along with socio-environmental issues from an early age, through an educational attitude, as well as the understanding that we are all co-responsible for what society produces and discards. The educational-environmental issue is also a strategy to face the problems related to the recycling of urban solid waste. Although there have been laws approved since 2010, only the current legislation is still insufficient. There is a lack of interest in the correct disposal of urban waste, which reveals indifference to those who work in recycling (waste pickers). It is important to work with the quality of life in order to promote local and regional development.
2	Almeida; Gomes (2017).	Discourse and Power in the Formulation of Environmental Public Policies: The Case of the National Policy on Solid Waste.	The definitions of power by Foucault, Elias and Bourdieu represent the theoretical starting point of this work, insofar as they consider power as something that depends on established relations, and that is symbolic. Thus, it is assumed that power can be exercised by language and, in this case, critical discourse analysis can be a useful method to capture the power strategies of actors in decision-making processes. The case of the formulation of the National Policy on Solid Waste, Law No. 12,305, which was marked by disputes of interest that made the legislative process last almost 20 years, was analyzed. The main objective of the analysis was to identify how the actors who participated in the public hearings exercised power seeking to influence the elaboration of the policy, especially with regard to two points considered innovative: shared responsibility and the inclusion of waste pickers in waste management. For data analysis, the general modes of operation of ideology and construction strategies were used identified by Thompson (2000). The strategies more used were dissimulation and legitimation. The first sought to hide relations of domination and the second aimed to legitimize an idea, whether of shared responsibility, or in defense of the incineration of waste as opposed to recycling with the inclusion of waste pickers. The results presented reveal that the discursive strategies of the exercise of power by the actors are an important explanatory aspect of the decision-making process in public policies, although little explored.
3	Siqueira; Costa; Vieira (2017).	Networks of power in Ventures Solidarity From Recycling.	In enterprises belonging to the solidarity economy scenario, decision-making power is usually distributed and shared among the cooperative members, being, therefore, decentralized, democratic, diffuse and horizontal, in a panorama in which the votes have the same value, regardless of

			<p>the actor. Organizations of this nature are characterized by the joint and integrated possession of the means production and democratic management (or self-management), in addition to of the equitable distribution of revenue from what is obtained as surplus for members, as defended by França-Filho (2012). In this context, this work aims to analyze the network of power relations in solidarity enterprises in six cooperatives for the collection and recycling of solid waste. The study was considered exploratory, with a qualitative-quantitative approach, conducted by the multiple case study strategy (YIN, 2006) in five cooperatives of collection and separation of recyclable materials from the greater ABC region of São Paulo and one from the city of Cotia (SP). For the construction and analysis of the networks, the Ucinet 6.0 software was used. In order to obtain data that could be analyzed qualitatively, interviews were conducted with cooperative members and managers, in order to gather evidence that could corroborate the analysis of the networks. The theoretical basis of the study was the typology of power proposed by Mintzberg (1983), presented in six configurations; autocracy, instrument, missionary, meritocracy, autonomous system and political arena. In presenting such a proposal, the same author argues that the organization is not limited to a certain configuration, but that there is the possibility of combinations and transition of stages, according to their maturity, and such dynamics generate their own organizational development. Thus, the existing coalitions between these configurations, addressed by Paz (1997; 2001; 2004) and Gosendo (2009), were also considered in the conceptual field, resulting in four systems: the system of authority, the ideological system of specialists, and the political system. The results point to a power generally centralized in the main manager (president), revealed in a centralized way in four of the six cooperatives, and only two were adherent to a participatory management model, however, of these two, only one stood out for its economic results, differentiating itself from the others by the managerial skills of its president. In addition, the study also demonstrates that the power and collaboration among the cooperative members are linked to the results of the economic and financial sustainability of the cooperative, when based on the more professionalized management model. This investigation sought to help fill a gap in empirical studies of power in solidarity enterprises, which have in collegiate decisions, the main principle of solidarity economy, self-management.</p>
4	Mendonça et al (2017).	Reverse logistics in Brazil: One Study on The Environmental Mechanism, Corporate Social Responsibility and the relevant legislation.	<p>This article addresses two topics of study of Environmental Law: reverse logistics and environmental liability. The first of them, brought to the legal system by the federal law on the National Solid Waste Policy (PNRS), is addressed in order to correlate its applicability in Brazil and abroad, as well as its main aspects. Its historical evolution in Brazil and in the world will be demonstrated, the first legislations that provided</p>

			for it, in addition to an analysis of its triple aspect, encompassing the civil, criminal and administrative areas. The importance of the theme in the Brazilian doctrine will also be demonstrated, in addition to the understanding of the Superior Courts. Some information is missing from the conclusions. (It can be seen, therefore, that Brazil is still based on post-consumption recycling and informal post-consumption collection) (...)
5	Espíndola; Netto; Souza (2017).	Social management in the context of environmental management: analysis of the creation and operationalization of the 3r Arq-Ufsc Project.	The socio-environmental crisis faced by contemporary society points to the permanent need to think of alternatives for the development of life in society. Social management has been presented as an alternative in the area of public administration, where the participation of citizens in the production of the common good is a prerogative of the processes of deliberative participation, and which can lead to emancipation. This research, carried out through a qualitative case study, aimed to analyze the process of creation and operationalization of the 3R project (Reduction, Reuse and Recycling) of ARQ-UFSC (Department of Architecture and Urbanism of the Federal University of Santa Catarina) in the light of the assumptions conceptual frameworks that underlie social management in the context of environmental management. The aforementioned research was based on the implementation of a differentiated culture for solid waste management within the scope of the Department of Architecture and Urbanism of the Technological Center of the Federal University of Santa Catarina. The data analysis indicated that the idea of interdisciplinarity that involved the creation of the project, combined with participatory practice, operationalized aspects of the theoretical approach to social management.
6	Silva; Knoll; Neto (2016).	The co-production of Public Service at Recycling Solid waste: study in the city of Florianópolis.	The concentration of income and decrease in access to decent work have led to the need for a new model for public services. The process of urbanization and industrialization of Brazilian society has led many people to the outskirts of cities, in addition to the growth in the production of urban solid waste, which can be recycled. Co-production is an alternative to, from recycling, obtain results for the community, from the point of view of income distribution and access to work. Thus, the present work aims to analyze the co-production of public service in the recycling of solid waste, through a study in the Municipality of Florianópolis. The relationships between the municipal company that collects solid waste, an association of waste pickers and a private company that acquires part of this material were analyzed. It was possible to identify the characteristics of co-production, the predominant model of symbolic co-production and its management mode.
7	Morais; Frey; Ravassa (2016).	Study of the optimal distribution of recycling material collection units in São Bernardo do Campo –	Recycling has proven to be an excellent opportunity for new enterprises, translating into employment and income for various social levels. In view of this, the present study aims to map the

		a map for the social investor.	potential points of supply of solid waste and find out what would be the best geographical location in São Bernardo do Campo for the implementation of collection units of these recycled materials. The potential supply points obtained in this study began to compose a network distribution model, represented by a graph, where the "nodes" of the graph represent the geographic location of each of the points and the "edges" of the graphs the distances between each of them and a strategic point, whose Cartesian coordinates constituted the variables of the model. To solve the model, the algorithm known as Generalized Reduced Gradient (GRG) was used. The results and methodology used in this research are presented and can support the decision-making of social investors.
8	Floriani; Furlanetto; Sehnem (2016).	Sustainable disposal of waste tires	This work Presents as an objective to address the process of collection and recycling of waste tires in Brazil, along with the verification of the actions developed by tire manufacturers after the creation of the National Solid Waste Policy. The verification of the evolution of the percentage of recycled tires and the role of collection points for the growth of this economic segment. The theoretical foundation was built portraying concepts and characteristics of sustainability, along with the current legislation on the subject and interrelating with the reverse logistics of waste tires in Brazil over the years. The methodology was developed from a case study of the company Reciclanip, addressing the company's actions for the growth of tire recycling and also the realization of an analysis of the importance of collection points for compliance with current legislation. The results show that there has been an increase in the percentage of recycled tires in Brazil since the establishment of the National Solid Waste Policy (PNRS). The collection process takes place from 824 points and recycling comprises the stages of co-processing, lamination, creation of rubber artifacts and rubber asphalt. In 2013, Brazil reached 95% of the proper disposal of waste tires, with the goal of collecting 479,429.60 tons of tires and verifying a destination of 459,030.18 tons. Therefore, it is possible to conclude that there is an awareness and improvement in the indicators, which may be associated with Law No. 12,305/10, which institutes PNRS.
9	Freita et al (2016).	Recycling Waste From Construction and Demolition (CDW): a case study at the Petrolina Waste Processing Plant - PE.	The development of civil construction in Brazil has significantly increased the amount of Construction and Demolition Waste (CDW). From Conama Resolution No. 307/2002 and the National Solid Waste Policy, the municipal government became responsible for establishing actions for the management of CDW or "debris" from construction sites and civil construction companies for the correct final disposal of that waste, aiming to reduce the environmental, social and financial impacts caused by its irregular disposal. In view of this scenario, the city of Petrolina/PE, in partnership with CTRP, implemented, in 2008, a Debris Processing Plant (UBE). In order to identify the strengths and

			<p>weaknesses of the CDW recycling process and propose improvements for its management, a case study was carried out, with monitoring of the process, documentary research and semi-structured interviews with those responsible for the UBE. The main weaknesses are the lack of segregation at the source, the inefficiency of waste collection and transportation, the presence of contaminants, the environmental impacts of the recycling operation and the low resistance of the blocks produced. As a potential, the processing capacity of the UBE stands out, which can process up to 2600 tons of CDW per month. Among the proposals for improvements, it is suggested the development of programs for segregation at source and for the collection of CDW, in addition to a partnership with the University to improve the quality of the product.</p>
10	Filho et al (2014)	Comparison between the masses of urban solid waste collected in the city of São Paulo through selective and household collection.	<p>The problem of urban solid waste requires effective actions to mitigate its environmental impacts. To this end, actions that promote sustainability practices in its management must be applied, involving the participation of the public and private sectors and the population, as already highlighted in the National Solid Waste Policy (PNRS), published in 2010. Actions such as selective collection and recycling, when properly integrated, provide significant benefits, such as reducing the volumes sent to landfills, reducing areas of irregular disposal, valuing and reinserting waste into the production chain, reducing the need to use natural resources, etc. However, despite the importance of adopting these actions, some municipalities do not have effective policies regarding selective collection and recycling, even after the publication of the PNRS. This paper presents the monthly monitoring carried out in 2013 of the masses of urban solid waste sent to sorting stations located in the city of São Paulo, seeking to compare the amounts from conventional household collection and those from selective collection. The results obtained indicate a great disparity in the masses obtained, with the mass coming from selective collection corresponding to only 1.9% of the collected, that is, a negligible value in relation to the total amount. It should be noted that selective collection is of great importance for the implementation of effective recycling actions, providing economic, social and environmental gains.</p>
11	Gonçalves; Tanaka; Amedomar (2013)	The final disposal of waste Urban Solids: Alternatives for the City of São Paulo Through Success Stories.	<p>This article studies the public cleaning service of household solid waste in the city of São Paulo, Brazil, based on the year 2010. It highlights problems associated with the current waste management model in São Paulo and proposes solutions to the most critical issues, having as a reference the appropriate treatment given by other globalized cities. The literature review seeks to elucidate the most relevant concepts to the study of this theme. Information is collected regarding the management of household solid waste and reverse logistics initiatives by the private sector, listing the obstacles observed in this municipality. National</p>

			<p>and international cases of success regarding the disposal of waste were studied, aiming to find sources of potential improvements. It is concluded that the proper disposal of waste, through recycling, composting or energy generation, requires the engagement of the population with waste separation and disposal habits, the involvement of the municipal administration, providing the necessary resources for the evolution of these alternatives and, finally, it cannot dispense with reverse logistics actions by the producing companies, respecting the federal legislation. By seeking to broaden the discussion on solid waste, the article seeks to insert this issue, in a more significant way, in the strategy and investment decisions of the public and private authorities.</p>
12	Vicente; Brendalis; Alves (2009).	Social entrepreneurship: waste recycling as a source of socioeconomic inclusion and environmental preservation.	<p>This article analyzes and describes a Third Sector organization, emphasizing the entrepreneurial spirit and strategies of the agents responsible for the creation and development of the Association in Defense of the Environment and Citizenship Caminho Verde, located in the municipality of Campo Limpo Paulista, State of São Paulo. The Association has been building, for more than a decade, a history of struggles in defense of the environment and citizenship. The article addresses a case study regarding the recycling process of used frying oil, from its collection to its final transformation into biodiesel. The analysis suggests that waste recycling managed through social entrepreneurship promotes the maximization of social returns instead of profit, and can be considered an efficient process of reducing the volume of solid waste and preserving the environment.</p>
13	Dias (2006).	Reflections, dilemmas and responsibilities related to the end of life of packaging.	<p>The need to consider the fate of packaging, after its original use, has been growing in recent decades. Seen sometimes as a receptacle of products avidly consumed, sometimes as great villains of environmental problems, packaging poses important challenges to the understanding of its conception and revaluation at the end of its life. This article, therefore, intends to promote a dialogue between the fields of design, sustainability and the life cycle of packaging. Seeking to advance in the understanding of the possibilities, challenges and dilemmas of managing the end of life of packaging, it places special emphasis on plastic packaging due to the growing volume of solid waste from households. The literature review points to concepts and practices still under construction. Thus, this article presents a systematization and structuring of the main concepts, not only summarizing the existing literature, but also bringing some examples of the valorization of plastic packaging; Legislation from the international and Brazilian context is also discussed. However, it is possible to anticipate that the theme presupposes an increase in the level of information of the population, elimination of waste from conception, development of technologies, shared responsibilities, recycling, but above all a change in the behavioral pattern of today's society.</p>
14	Zortea (2001).	Analysis of costs for the	Currently, both companies and public

		<p>recycling of paper fibers from Tetra Pak packages in Porto Alegre.</p>	<p>administrations are looking for a sustainable way of coexistence. Within this coexistence in cities, the management of solid waste, including Tetra Pak packages, is beginning to receive some attention regarding its reuse and recyclability. Based on the idea of innovative processes and the search for solutions through research, the Tetra Pak Company discovered recyclability processes for its Long Life packages, offering them a technological feasibility of recycling. Through instruments such as life cycle analysis, it is possible to verify the costs incorporated in the manufacturing and recycling process of Tetra Pak packages, for a subsequent economic analysis. The article studies some items that influence an analysis of the economic feasibility of recycling Tetra Pak packages. In the course of the work, the values of home and selective collection in Porto Alegre are demonstrated, their costs and variables that influence the low value of these collections in the city. The costs of obtaining and recycling the paper fibres from Tetra Pak packages are also verified, comparing this with the normal paper recycling process. From there, some conclusions and ideas are reached for the fate of this recycling process.</p>
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From the specification of the academic productions, selected for systematic review of the literature, the following keywords are found in each listed work, following the order of the table presented above:

Image 03. Structuring of the keywords of the selected works.

Text n°	Keywords
1	Solid waste. Environmental planning. Regional development. Environmental public policies. Environmental education.
2	Power. Speech. Public policies. Solid waste.
3	Social Network. Power. Cooperatives. Solidarity Economy.
4	Reverse Logistics; Responsibility; Jurisprudence;
5	Public administration; Environmental management; Social management; University.
6	Public Service Co-production; Management Modes; Solid Waste Recycling.
7	Non-linear programming; solid waste management; recycling.
8	Sustainability. Reverse logistics. Sustainable disposal.
9	Processing of rubble; Construction; Environmental impact.
10	Urban Solid Waste, Sustainability, Recycling.
11	Waste Solid. Urban cleaning. Recycling. Reverse logistics. Garbage. Sustainability. Environment.
12	Social entrepreneurship, Waste recycling, Used frying oil.
13	Packaging Design, Packaging Life Cycle, Plastic Packaging.
14	Tetra Pak packages. Selective collection. Costs. Economic viability.

Source: Prepared by the authors

From the keywords listed, it is possible to glimpse the multidisciplinary that exists in the context of solid waste recycling, and the problem can be applied in the most diverse areas of research and not exclusively the mentioned context, combining various objects of study.

Image 04. Diagram of word cloud grouped according to the 20 keywords used by the authors



Source: Prepared by the authors

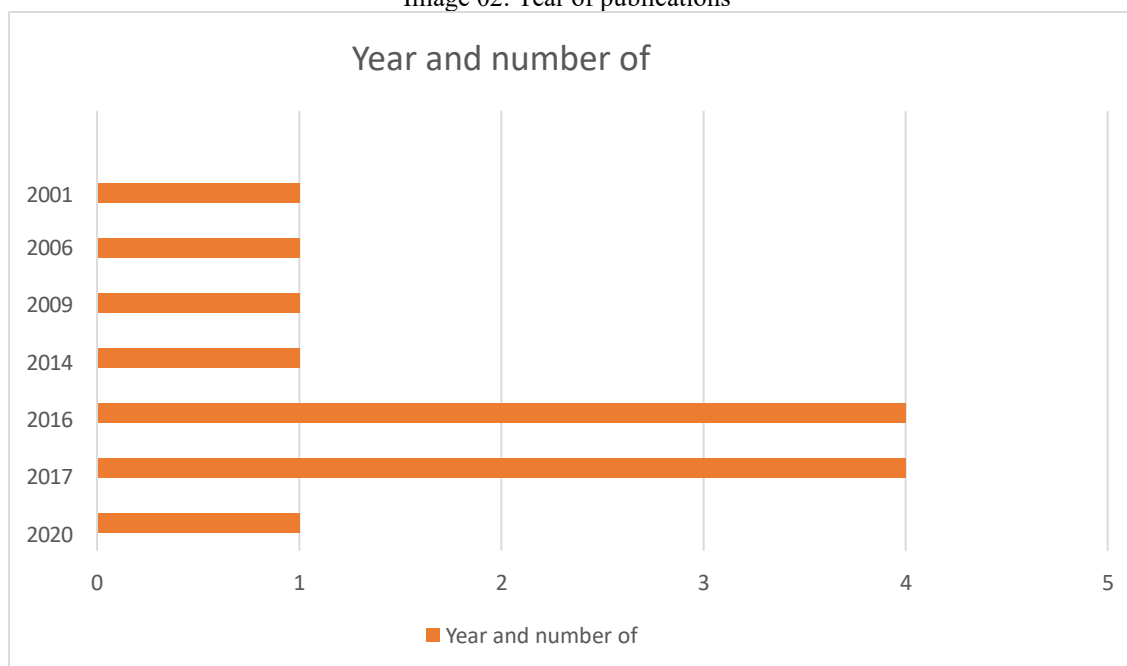
Disregarding the recurrent preposition "de", we have in a cloud diagram the recurrent catch in the keywords of the selected works, the first 20.

Image 05. Top 20 Keywords in Works

Classification	Keyword	Recurrence
1	Of	10
2	Waste	7
3	Solids	6
4	Recycling	5
5	Environmental	4
6	Packaging	4
7	Management	3
8	Logistics	3
9	Reverse	3
10	Social	3
11	Sustainability	3
12	Power	2
13	Policies	2
14	Public	2
15	Administration	1
16	Environmental	1
17	Environment	1
18	Benefit	1
19	Cycle	1
20	Civil	1

Regarding the years of publications, there are:

Image 02. Year of publications



Source: Prepared by the authors

It is noted that the selected publications, in addition to not being found in large quantities prior to 2016, also did not prosper quantitatively until 2023, the date of the research, when no article entered the adopted selection, due to non-existence, the last year being 2020. The years 2001, 2006, 2009 and 2014 receive one publication each, while the years 2016 and 2017 register four publications, and the year 2020 registers only one publication, respectively.

In view of this information, it is evident that the global context of excessive waste production, the growing resumption of the theme of Cooperativism, Public Policies, Solid Waste Recycling, National Solid Waste Policy, began to be addressed with greater emphasis in the periods presented.

In view of this information, it is evident that the global context of excessive waste production, with the resumption of literary production on the theme of Cooperativism, Public Policies, Solid Waste Recycling and National Solid Waste Policy, began to be addressed with greater emphasis in the years 2016 and 2017, in the context of research in the Administration, which was the niche chosen for this systematic review.

It is also relevant to address the historical context that culminated the present decades applied as a filter of the study, 2001 to 2020, with emphasis on the eighteenth and nineteenth centuries with the Industrial Revolution and the beginning of a new period in the relationship between society and balanced environment. The increase in the influence of the activities of the new society on the cycles of nature was remarkable, which translated into a progressive "humanization of natural landscapes and degradation of the environment, source and final destination of all resources and waste." (VENTURA, 2004).

The increase in population, with the rural exodus especially in urban areas, and the technological progress spread from globalization, ~~has resulted~~ in an enormous overload on natural

resources, whether in the field of raw materials, fossil fuels, water and other waste (VENTURA, 2004).


The National Solid Waste Policy was instituted in August 2010, a year in which there was no literary production complying with the requirements added as a filter in this research, which are those described in the Methodology, one of these filters being the search design using the keywords "solid waste recycling". This fact makes it possible to question the low scientific production related to solid waste management, considering that in the period of time covered in the systematic review, it comprises the year that was instituted nationally, a remarkable fact for the sustainable theme, National Solid Waste Policy.

It is concluded, by this systematic review, after careful analysis of the articles found, that the same environment that generated the advances of society, also serves later for the place destined for the discards as a result of this economy, with such short cycles for great profitability, and enormous losses, with extensive degradation of nature. Finally, there is little recurrence in the production of this theme, which denotes the worsening of the environmental situation, making it necessary to increase academic views of the environmental problem.

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Technology and society: Its contribution to the emergence of computational thinking

 <https://doi.org/10.56238/sevened2024.014-026>

Elizabeth de Araujo Cavalcante¹

ABSTRACT

Nowadays, technology has gained more space in our society and has increasingly been part of our routines. And when we talk about technology, it does not mean reducing it only to the use of computers and machines, because historically this term is broad and comprehensive. The modern and postmodern periods are important milestones in the history of the relationship between technology and society. The modern period, which extends from the sixteenth to the nineteenth century, was marked by the development of science and technology. The Industrial Revolution, for example, was a time of great technological advances, which had a profound impact on society. In the postmodern period, technology is becoming increasingly complex and fast-paced. This is driving significant changes in society, such as the globalization of the economy, the rise of popular culture, and the emergence of new social movements. One of the main contributions of technology to society is the emergence of computational thinking. Computational thinking is a way of thinking that is based on the principles of computing. It involves the ability to solve problems, think logically and creatively, and communicate ideas clearly and concisely. Based on the understanding that modernity is born with the integration of science with technique, and that postmodernity questions this integration with broader conceptualizations and understandings, this article discusses the relationship between technology and society, focusing on the contribution of technology to the emergence of computational thinking. Technology is playing a key role in the development of computational thinking by providing people with tools, opportunities, and incentives to think computationally. Computational thinking is an essential skill for success in the modern world, and technology is helping people develop it.

Keywords: Technology, Society, Computational Thinking, Problem Solving, Logical Thinking, Creativity, Communication.

¹ Vale do Itajaí University (UNIVALI)
E-mail: elizabeth@ifce.edu.br

INTRODUCTION

TECHNOLOGY IN MODERNITY AND POST-MODERNITY.

This ideological conception marks a modification of thought that until then was considered medieval because it was directed to the Christian faith, to a reflective thought aimed at valuing reason and experimentation.

The existing literature points out that modern philosophy has come to be known for several characteristics such as: the search to reach the truth, appreciation of reason, absolute knowledge, search for values; and, in these perspectives, they were organized into philosophical currents, such as the most expressive at the time, such as Empiricism and Rationalism.

According to Marques (2020, p.1)

The first current gained strength from the ideals spread by philosophers René Descartes and Gottfried Wilhelm Leibniz. For rationalists, true knowledge was that obtained from rationality, and should eliminate everything that is learned from experiences. The second philosophical current, on the other hand, defended an idea contrary to rationalism, following the conception that practical experience was the key to the construction of knowledge. The more intense and rich this experience was, the greater and deeper this learning would be. The philosophers who pushed this current forward were Thomas Hobbes, John Locke, and David Hume.

The two modern conceptions just presented mark the discourse of the crisis of science in its theoretical nature and modified by productive technique. An example to cite is the physicist Galileo Galilei, who became known as the father of modern science for being the first to introduce experimentation into science.

As a result, modernity began to discuss not only the idea of experimentation, but also to think about the role of man in the domain of techniques. It is important to infer that Neto (2010) corroborates this statement when he asks that along with the idea of experimentation and technological intervention "the idea of scientific and technical conquest of all reality predominates, based on the mechanical and mathematical explanation of the Universe and the invention of machines, thanks to physical and chemical experiments". (NETO, 2010, p. 14)

However, this technological intervention can be understood as the way to recreate or produce something with nature in order to obtain improvements, which shows a strengthening between science and technique, and, according to Miranda (2002), technology would be a result of this union between science and technology.

According to Oliveira (2008) it is in the modern age that the term 'technique' comes to have the denomination of technology, the author also argues that events that occurred at that time such as (fall from feudalism, increase of trade, urbanization, alteration of the divine law by reason) "necessarily enabled the development of a new knowledge – modern science and technique or technology". (OLIVEIRA, 2008, p. 6)

Technology then becomes the center of discussions within modern society with a view to different understandings and associations, especially after the industrial revolution, being analyzed not only for its integrating power between science and technique, but also for its relations of use and power in the society known as industrial and later post-modern.

It is relevant within this delineation to understand that postmodern philosophy is a philosophical movement that was born in the middle of the 20th century. However, this movement appeared in the form of criticism of philosophical ideas about modernity with regard to concepts such as culture, language, history and identity, very present during the eighteenth century with the Enlightenment.

Within this scenario, **Jean François Lyotard is presented** as one of the greatest philosophers to conceptualize postmodernity, so that his ideas continue to reverberate through the revolution of the impact of technology between knowledge and the computerized world. In his work "The Postmodern Condition" it is observed that the author makes a reflection and analysis on science, knowledge and technology in capitalist societies.

His study has as its central hypothesis the understanding that "knowledge changes status at the same time that societies enter the so-called post-industrial age and cultures enter the so-called post-modern age". (LYOTARD, 2009, p. 3). This statement leads to reflections that are as current as those posed by the author, because in a larger context it would be to ask the question: What is the place of knowledge within developed societies?

However, what Lyotard wanted to express in his study would be a modification of science in its nature caused by technological repercussions, based on the assumption that "Scientific knowledge is a kind of discourse". (LYOTARD, 2009, p. 3)

The author also adds that:

Now, it can be said that for forty years the so-called avant-garde sciences and techniques have dealt with language: phonology and linguistic theories, the problems of communication and cybernetics, modern mathematics and informatics, computers and their languages, the problems of translating languages and the search for compatibilities between languages, machines, the problems of memorization and databases, telematics and the installation of "intelligent" terminals, the paradoxology: "here are some evident proofs, and the list is not exhaustive. (LYOTARD, 2009, p. 3)

What the author brings with this question would be a reflection that knowledge loses its sense of formation and, as cited by Telles (2017), knowledge changes configuration because there are producers and consumers of knowledge, causing knowledge to be produced to be sold.

However, this view brought by Lyotard refers precisely to the fact that it is necessary to understand how much technological transformations impact the means of production and the way knowledge is distributed. Therefore, in his theoretical path, the author adds that scientific knowledge presents conflicts of legitimacy between knowledge and power.

Another relevant issue raised by Lyotard is his statement that "the postmodern scenario is essentially cybernetic, computerized and informational." (LYOTARD, 1998, p. 7)

With this statement, the author brings a perspective that efforts should be made to computerize society, whether these efforts are technological, scientific or political. (NESPOLI, 2004).

From this perspective, it would be necessary to understand the understanding of what the computerized society would necessarily be, starting from the understanding that the computerized society emerged as a delineation of a new society that was later called the information society, as follows.

THE INFORMATION SOCIETY AND THE KNOWLEDGE SOCIETY

Studies indicate that the term information society first emerged as a concept with the economist Fritz Machlup, when he published his book in 1962 entitled *The Production and Distribution of Knowledge*. However, as Coutinho and Lisboa (2011) infer "the development of the concept is due to Peter Drucker who, in 1966, in the bestseller *The Age of Discontinuity*, speaks for the first time of a post-industrial society in which the power of the economy would have evolved from agriculture to industry". (COUTINHO; LISBON, 2011, p. 6)

In addition, history points out that the information society was born in the middle of the twentieth century, marking a time when technology made great advances, and this view refers to a reflection that the information society would be a successor to the industrial society. In this way, the information society begins to take shape in a conjuncture of technological development.

It is in this context that Manuel Castells Oliván, a Spanish sociologist and university professor, began to talk about the transformation of an industrial society into an informational society, a movement that began in the 1970s. The author sought to analyze the information society or information age from the perspective of understanding how society is reconfigured from information and communication technologies (ICTs), and what is the impact caused by technological advancement.

Castells focuses his study on this new configuration known as the Information Age, or Digital Age, where in this new delineation of society, the movement of action exerted is in relation to the technologies that evolve so that the individual acts on information. Thus, the author writes one of his most important researches called "The Information Age", which was published in trilogy format between 1996 and 1998.

In the first volume "The Network Society", Castells starts to bring a concept of informational capitalism, because according to him capitalism has to reinvent itself to get out of the structural crisis. This would only be possible through technological advancement and productive restructuring.

With this, he argues that information technologies would be the paradigm to restructure the mode of production. However, for Castells, it is useful to highlight the paradigms of information technology as central aspects so that they can serve as a kind of guide for future paths of social transformation. Namely: "technologies to act on information"; "the penetrability of the effects of new technologies"; and "the logic of networks" (CASTELLS 1999, p. 108)

In the second volume "The Power of Identity". The author places as a central key to the edition the distinction of three forms of identities, namely: legitimizing identity, identity of resistance and identity of project.

And, finally, in the third volume "End of the Millennium" the author conducts an important study on the economic and political transformations that took place in the extinct Soviet Union, and brings a description of its relationship with the information system.

Despite discussing the important role of technology in society, the author ponders that it is not only technology that defines society, but also economic, cultural, and political factors that constitute the network society.

Corroborating, Gouveia (2004) argues that technologies alone would not have the power to transform society alone, because it must be understood that they are used by people in their multiple spaces and contexts, both economic, political and social. As the author infers:

The Information Society is based on information and communication technologies that involve the acquisition, storage, processing and distribution of information by electronic means, such as radio, television, telephone and computers, among others (GOUVEIA, 2004, p. 1).

Corroborating, Oliveira and Bazi (2008) reflect that in the historicity of the Information Society, there are divergences in its historical context with that of other periods, as is the case of the history of post-modern society, information technology and the knowledge society.

When it comes to the Knowledge society, this concept appeared in the 1990s. Núñez (2022) argues that, soon after telecommunications and information technology experienced their peak in the 1970s, society needed new circumstances for the processing of information. Also according to the author, it was in this context that in the 90s the debates intensified, giving rise to the term knowledge society, which would be an option to the term information society.

However, Leite² complements by stating that it was from 1995 that the term knowledge society was introduced "on the agenda of meetings of the European Community and the Organization for Economic Cooperation and Development, which brings together the thirty most developed countries on Earth." Thus, the term was adopted by the World Bank and the U.S. Government.

² University Professor. Pedagogue and lawyer. Master in Law. Master in philosophy. Dr. in Law. Counselor of the INPJ. National Institute of Legal Research.

Burch (2005, p.3) emphasizes that:

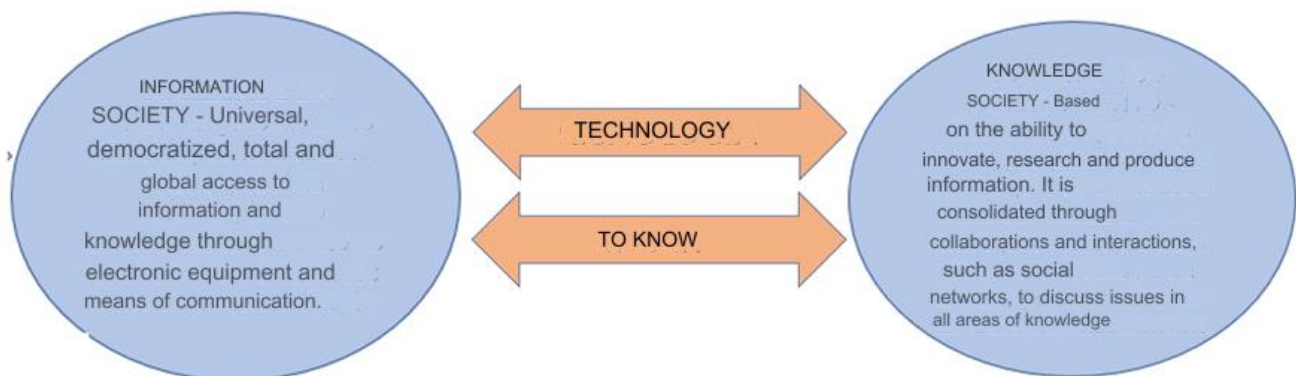
[...] UNESCO, in particular, has adopted the term "knowledge society" or its variant "knowledge societies" within its institutional policies. He developed a reflection on the subject that seeks to incorporate a more integral conception, not linked only to the economic dimension.

Burch cites that UNESCO Deputy Director-General Abdul Waheed Khan argues that using the concept of the knowledge society is better than that of the information society because it is a more coherent way of expressing the complexities and changes that are taking place.

In addition, the author infers that both companies have their relevance. The Information Society, due to its contribution to analysis, technology exerts a fundamental influence on the system of society, standing out as a driver of economic progress. And the Knowledge Society has its relevance because it guides policies and actions, and "technology is the support that triggered an acceleration of this process; but it is not a neutral factor, nor is its course inexorable, since technological development itself is guided by games of interests". (BURCH, 2005, p. 5)

However, these definitions of concepts even contribute to a single definition called the Information and Knowledge Society, which has also not been widely accepted by some scholars. After a careful study of the definitions of these companies, the general characteristics intermediated by two links are presented in a simpler logic of understanding, as shown in figure 1 below

Figure 1. Definitions and links between the terms Information Society and Knowledge Society.



Source: prepared by the authors.

What is observed is that these two concepts are often confused or even in some contexts are used in confusing or random ways, as if both had the same meaning. However, that is why so many discussions arose in order to align and define each one, bringing their distinctions. (NETO; JUNIOR; VALENTINE; 2013)

However, there are important discussions about these two concepts. An example would be that of the author Newton Duarte, who makes a critique of the knowledge society, because according

to the author this society "is, by itself, an illusion that fulfills a certain ideological function in contemporary capitalist society". (DUARTE, 2008, p. 10)

Regarding the links between Technology and Knowledge, they permeate the two spheres of societies discussed, presenting the same relevance with different roles, where Technology processes and brings development and Knowledge adds and gives value, and both have their interfaces in the economic, social, political and educational spheres.

Considering here only the educational sphere, we have, concomitant with these configurations of societies, the effect of these movements on teaching-learning, where in the Information Society what exists is the intensive use of Information and Communication Technologies (ICTs), not only in the sense of bringing innovation to teaching, but also with the objective of relating science, technology and education.

In the knowledge society, ICTs continued to be used, but in the 80's Papert through the language Logo³ introduces computing in basic education and with this emerges what would be called computational thinking. (BRACKMANN, 2017 p. 24)

COMPUTATIONAL THINKING – EMERGENCE, CONCEPT AND PILLARS.

The term computational thinking is increasingly used today, according to Jeanette Wing (2006) it consists of a group of skills and attitudes that everyone, not only computer scientists, were interested in learning and using. This statement by the author is due to the fact that it is an emerging term and that it was used for the first time by Seymour Papert in 1980.

Vieira (2018, p.27) cites that although Computational thinking is a term used by Wing in 2006, previous authors such as Alan Perlis in the 60s and Papert in the 80s already explored this idea in their works, however the enunciation computational thinking became evident only when she published an article in Communications of the ACM, a journal of the Association for Computing Machinery⁴.

In this article, the author argues that computational thinking is an essential skill for everyone, not only for computer scientists, with this the author brings the prominence of the discussion of the integration of computational thinking with other areas of knowledge and other disciplines.

According to Wing, computational thinking "involves solving problems, designing systems, and understanding human behavior by extracting fundamental concepts from computer science." (WING, 2006, p. 33). The reflections brought by the author refer to an understanding in the sense of a definition of what computational thinking would be and was the basis for discussion for other

³ A programming language designed to be a learning tool.

⁴ Association for Computing Machinery – created in 1947 and is the first scientific and educational society designated to computing.

scholars in the area to focus on the understanding and use of the term computational thinking. However, according to RAABE; ZORZO; BLIKSTEIN (2020) the term does not have a closed and defined construction, given that there are numerous disparities in definitions and understandings of the term. Let's look at some concepts:

"It is the process of recognizing aspects of computing in a world around us and applying tools and techniques from Computer Science to understand and argue about natural and artificial systems and processes." (FURBER, 2012).

"Computational Thinking is a methodology that is acquired by learning concepts from Computer Science and, therefore, is not characterized as a discipline by itself. However, as a methodology, it can and should be used, in an interdisciplinary way, in any other discipline". (VICARI; MOREIRA; MENEZES, 2018, p. 25)

"Computational Thinking refers to the ability to systematize, represent, analyze, and solve problems." (SBC, 2017, p. 3)

"Computational thinking is the process of thought involved in formulating a problem and expressing its solution(s) in such a way that a computer – human or machine – can effectively accomplish." (WING, 2017, p. 8)

For Brackmann (2017) there is another question when defining the term computational thinking that would be the limit between Computing and Computational Thinking or what interaction Computational Thinking would have with Computing, for this author the boundary between them was not clearly established.

The outlines, studies and discussions deal not only with the understanding of the term and its scope, but also break down deeper barriers between its conceptions and characteristics associated with computer science. And it is in this sense that the four pillars of computational thinking emerge with the purpose of guiding problem solving. They are:

1. **Decomposition:** it consists of the ability to discover a complex problem and break it down into small parts that are easier to conduct and manage.
2. **Pattern recognition:** Recognize similar problems or similarity to situations already presented previously using previous experience to solve them.
3. **Abstraction:** focusing on the most relevant data without privileging the details, and thus defined, the non-relevant ones are discarded, allowing the solution to be applicable to other problems
4. **Algorithmic thinking:** consists of the ability to create instructions (steps) or solutions with the purpose of solving the problem.



Based on these four pillars, it is easy to understand that computational thinking is present in our daily lives in the most diverse forms and situations of everyday life and, according to Noletto (2021), using certain computational thinking skills can generate more success in solving problems.

Wing (2007) emphasizes that computational thinking will be an essential skill to be used by everyone in the world in the mid-21st century, and computational thinking "enables what a human being cannot do alone to: solve problems; design systems; understand the power and limits of human and machine intelligence" (WING, 2007, p. 3)

The author is a visionary in this sense, because computing in basic computing is a reality that is increasingly present in all curricula in the world. Computational thinking has brought into teaching a new methodology that uses different skills to teach and learn by associating the most diverse areas of knowledge.

FINAL CONSIDERATIONS

Computational thinking is consolidated as an essential skill for the information and knowledge society. This is due to the fact that technology is transforming the way people work, learn, and communicate

It is noteworthy that in the information society, people need to be able to solve problems in a creative and innovative way. This requires computational thinking, which allows people to analyze problems, identify solutions, and implement solutions.

It is clear that in the knowledge society, people need to be able to learn quickly and effectively. This requires computational thinking, which allows people to understand complex concepts and apply the knowledge in different situations.

It is evident that discussions about information technology and the knowledge society contributed to the emergence of computational thinking by highlighting the need for digital skills and complex problem solving in the information age.

It is concluded that in the information and knowledge society, people need to be able to communicate clearly and concisely. This requires computational thinking, which allows people to organize ideas and convey them effectively.

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Sexual maturation associated with anthropometric measurements in elementary school adolescents

 <https://doi.org/10.56238/sevned2024.014-027>

Geovane Biet de Sousa¹, Marta Carolina Terto de Morais², Jeanne Eduarda da Silva³, Arthur Franklin Araújo Justinian⁴, Carolinne Vitória Alves de Souza⁵, Barbara Cristina Soares de Souza⁶, Gleycikele Gomes Seguro⁷, Imanuel Prado Ferreira⁸, Daniel Alves Medeiros⁹ and Silvia Teixeira de Pinho¹⁰

ABSTRACT

Adolescence is an important phase of life where the body undergoes significant changes, transitioning from a child's body to an adult body. The influence of physical growth and sexual maturation can interfere with the individual's body composition. The objective of this study was to verify sexual maturation in boys and girls and its possible association with anthropometric measurements from two schools in Porto Velho-RO participating in the Pedagogical Residency Program. This work is characterized as a descriptive, cross-sectional field research, with a convenience sample, non-probabilistic and with a quantitative focus. The population of the present study was composed of 163 male and female schoolchildren aged 10 to 18 years, enrolled in 2 elementary schools. neck circumference (NC) and waist circumference (WC). In the descriptive analysis, the measures of central tendency and dispersion were represented by means, standard deviations, and median and interquartile median. For categorical variables, absolute frequency measures were performed. All statistical analyses were performed using the SPSS statistical software package, version 17.0. The results showed that, in relation to BMI, the mean of girls was 21.30 (SD=5.23), and that of boys was 19.69 (SD=4.42). The mean NC of boys was 31.56 (SD=3.15), while that of girls was 33.12 (SD=3.15). The WC of boys was 70.35 (SD=9.48) and girls 70.98 (SD=10.75), in which there was a close variation between both sexes. It was found that girls stood out in relation to weight, height, waist circumference and neck circumference, and there was no significant correlation with BMI. The findings show that there is a positive association between the female gender and the measurements of NC and WC. Thus, this study evidences results that affirm the association between maturation indicators and obesity, especially in girls.

Keywords: Sexual maturation, Schoolchildren, Anthropometric measurements.

¹ Graduating in Physical Education
Federal University of Rondônia

² Degree in Physical Education
Federal University of Rondônia

³ Degree in Physical Education
Federal University of Rondônia

⁴ Master's student in Psychology
Federal University of Rondônia

⁵ Graduating in Physical Education
Federal University of Rondônia

⁶ Graduating in Physical Education
Federal University of Rondônia

⁷ Graduating in Physical Education
Federal University of Rondônia

⁸ Master's student in Psychology
Federal University of Rondônia

⁹ Master in Physical Education
Professor at the Federal Institute of Rondônia

¹⁰ Doctor in Physical Education
Professor at the Federal University of Rondônia



INTRODUCTION

The Pedagogical Residency Program (PRP) has an initiative aimed at the integral training of future teachers who think about health through physical education, giving opportunity to students of undergraduate courses, experiencing the profession, knowing the school environment with greater precision, expanding their means of teaching, developing their creativity and didactics of a reflective and active teacher, and especially to future Physical Education professionals, as it provides a greater contact of experience and experience in the field of work, which corroborates an improvement of a more attentive, cautious look and a sense of research and projects. The Physical Education subproject is articulated with the CAPES improvement program with the objective of teacher training in licentiate courses, allowing the experience of school management and pedagogical intervention. In view of this, the PRP of the Federal University of Rondônia decided to investigate the existence of the relationship between the nutritional status of boys and girls with their sexual maturation.

Within the school environment, Physical Education plays a very important role when it comes to overweight/obesity in adolescents, as it is a discipline that aims to provide and influence the student with a healthy and active lifestyle, controlling the obesity rate in schoolchildren. It should be emphasized that physical exercise should not be ended as an obligation, but as a pleasurable and fun act. Teachers should convey this message to students so that they associate physical exercise with well-being (GOMES, 2019).

It is known that adolescence is an important phase of life where the body undergoes significant changes, transitioning from a child's body to an adult body. According to Sawyer et al (2018), it considers this period where growth, maturation, and human development are enhanced.

Puberty is the period where the change in secondary sexual characteristics and sexual maturation in the human body is present (Hercowitz, 2021). Neta (2023) states that the entry of Precocious Puberty, being the passage from childhood to adulthood earlier than expected, can cause health risks, both psychic and physical for the child who goes through this stage. Such a condition brings with it psychosocial changes, changes in the formation of the individual's identity and subjectivity, so that the impacts are evidenced through the development of behavioral disorders, emotional immaturity and mental retardation (LÓPEZ-MIRALLES M, et al., 2022).

The influence of physical growth and sexual maturation can interfere with the individual's body composition and physical fitness, and physical activity is an important factor so that at this stage, adolescents can prevent numerous risk factors for chronic degenerative diseases throughout life, such as diabetes *mellitus*, respiratory problems, systemic arterial hypertension and dyslipidemia, which increases the risk of cardiovascular problems, in addition to multiple problems (ALVARENGA, 2013).

An increase in adipose mass is observed in the puberty process in children from generation Z, the World Health Organization (WHO), in 2024 states that the number of children and adolescents between 5 and 19 years old have been diagnosed with overweight or obesity since 1990 in the world has quadrupled. Obesity in adolescence is defined as excess body weight directed to the accumulation of fat cells in adipose tissue distributed throughout the body or regionally, being caused by genetic, endocrine, metabolic diseases or nutritional changes (FISBERG, 2016).

Thus, Abreu (2016) states that pubertal development usually begins between 8 and 13 years of age in girls, is characterized by the development of thelarche, followed by pubarche and after about 2 years, menarche; and, between 9 and 14 years of age in boys, with an increase in testicular volume, followed by pubarche and penile enlargement.

In Brazil, a retrospective cohort study by Cavalcante et al. (2014), conducted at the University Hospital of the Federal University of Ceará, observed 342 children diagnosed with central precocious puberty. Regarding the nutritional assessment, it can be observed that 177 (52.2%) had some level of overweight. However, only 89 (26.4%) sought treatment in a specialized service.

Currently in the literature it is notable that there is a visible relationship between overweight/obesity and early entry into puberty compared to children of normal weight, this relationship is often stronger when analyzed in girls, as studies have consistently shown that early or late sexual maturation, for example, is a risk factor for a higher incidence of overweight and obesity, especially in females. (XU et al 2022; FERRARI et al 2021; LOHIYA et al 2021; PEREIRA et al, 2021; LIU et al, 2020).

Therefore, the objective of this study was to verify sexual maturation in boys and girls and its possible association with anthropometric measurements from two schools in Porto Velho-RO participating in the PRP, since overweight/obese children often enter the puberty phase before the expected time.

METHODOLOGY

This work is characterized as a descriptive, cross-sectional field research, with a convenience sample, non-probabilistic and with a quantitative focus. The population of the present study was composed of 163 students aged 10 to 17 years, male and female, and enrolled in 2 elementary schools, the two selected schools are part of the PRP. Data were collected at the Bela Vista State School and the Dr. Oswaldo Pianna State School, both located in the city of Porto Velho - Rondônia.

The following data were collected for collection: weight and height for calculating the Body Mass Index; neck circumference and waist circumference.



DATA COLLECTION

The sample was intentional, starting in two schools in which preceptors and residents worked in data collection. During the collection period, the following data were obtained: weight and height for calculating the Body Mass Index (BMI); neck circumference (NC) and waist circumference (WC).

Height was measured using a tape measure with a resolution in millimeters and a maximum height of 200 cm, glued to the wall with adhesive tape. To measure height, the adolescents removed their shoes, they were positioned standing, motionless, upright, with their arms relaxed along their sides and their spine leaning against the wall with the tape in the center of the head.

To measure weight, a digital scale with a capacity of 200 kg and a precision of 50 g was used. The teenagers were weighed without their shoes and extra items of clothing or objects were removed from the pockets of their school uniforms. They positioned themselves with their feet together in the center of the scales, body upright, the weight distributed equally on both feet, motionless, with arms relaxed along the body, head in the anatomical position and with their gaze fixed on the wall ahead. The classification of body mass index (BMI) for age was carried out according to the World Health Organization (WHO, 2007) references for adolescents aged 10 to 19 years. The classification categories included: thinness, normal weight, overweight and obesity. Cutoff points adopted: normal weight = z score ≥ 1 and $+ < 1$, overweight = $\geq +1$ z score.

Waist circumference (WC) was measured using an inelastic tape measure, with resolution in millimeters and a length of 1.5 meters. To measure this measurement, the adolescent was placed upright, keeping the abdomen relaxed and the arms crossed over the chest. WC was measured at the midpoint between the last costal arch and the iliac crest, using a flexible anthropometric tape with a scale of 0.1 centimeters. WC was measured in duplicate and a third measurement was performed when there were differences greater than 0.1 cm between the measurements. The mean of the two measurements was used in the analyses. The subjects were classified according to the proposal of Freedman et al.¹⁰: increased risk ≥ 90 th percentile. In the present sample, this percentile represented 77.2 cm for boys and 71.44 cm for girls.

To measure Neck Circumference (NC), the team of researchers in the present study, composed of undergraduate students in Physical Education, duly trained to standardize the technique, used a tape measure with resolution in millimeters and extension of 1.5 meters. NC was measured with the adolescent standing and the head positioned in the Frankfurt horizontal plane. The resident positioned the tape measure exerting minimal pressure at the time of taking the measurement for better contact of the tape with the skin, and the measurement was considered just below the epiglottis. The neck circumference classification for boys (< 33 cm = normal and ≥ 33 cm = excess fat) and girls (≤ 31 cm = normal and > 31 cm = excess fat).

It is noteworthy that the ethical aspects of the research took into account the guidelines of Resolution No. 466, of December 12, 2012, of the National Health Council. The research has been approved by the Research Ethics Committee of the Federal University Foundation, under opinion number 4.630.406 (CAAE: 06783119.7.0000.5300).

DATA ANALYSIS

In the descriptive analysis, the measures of central tendency and dispersion were represented by means, standard deviations, and median and interquartile median. For categorical variables, absolute frequency measures were performed. For the comparison between the sexes, the Student's t-test was used, while the Shapiro Wilk test ($p > 0.05$) showed normal distribution, otherwise by median and interquartile. The chi-square test was used to calculate prevalence ($p < 0.05$). Binary Logistic Regression was used to verify the association between the exposure variable to the outcome female gender and the independent variables BMI, WC and NC and the following covariates were used for adjustment: age and sexual maturation. Odds ratios and 95% confidence intervals were obtained using multiple binary logistic regressions. $P \leq$ values of 0.05 were considered statistically significant. Calibration was calculated using the Hosmer-Lemeshow test and a p-value greater than 0.05 indicated that the model fits the data. All statistical analyses were performed using the SPSS statistical software package, version 17.0.

RESULTS AND DISCUSSION

The study included 163 students from Elementary School II from three schools in Porto Velho-RO. Table 1 presents the descriptive analysis of the sample, which shows that the mean age of boys and girls is similar, as follows: boys=13.00 (SD=1.86); girls=12.87 (SD=1.85).

Regarding BMI, the mean of the girls was 21.30 (SD=5.23), with 63% (45) classified as normal weight, but 37% (27) were classified as overweight. The mean BMI of the boys was 19.69 (SD=4.42), with 64% (58) classified as normal weight and 36% (33) boys classified as overweight.

The analysis of the NC of boys obtained a mean of 31.56 (SD=3.15), while that of girls was 33.12 (SD=3.15), of those investigated, 34% (31) boys and 55% (50) girls with excess fat and 66% (60) of boys and 45% (22) of girls classified as normal. Boys' WC was 70.35 (SD=9.48) and girls' 70.98 (SD=10.75), where there was a close variation between both sexes, with 20% (18) boys and 46% (33) girls in the risk zone. On the other hand, most of those investigated were classified in the healthy zone and 80% (73) of the boys and 54% (39) of the girls were found.

Table 1. Characterization of the sample of adolescent students in elementary school.

Variables	Average	DP	Variation
Boys = 91			
Age	13	1,86	10,00 – 17,00
Body mass	47,32	13,59	28,70 – 97,00
Body height	1,54	0,09	1,38 – 1,51
IMC	19,69	4,42	13,50 – 36,40
z score	0,69	1,69	-2,58 – 9,30
Waist circumference	70,35	9,48	56,00 – 98,00
Neck circumference	31,56	3,15	26,00 – 43,00
IMC	n	%	IC95%
Normal weight	58	63,7	53,48 – 72,87
Overweight	33	36,3	27,12 – 46,51
Neck Circumference			
Normal	60	65,9	55,72 – 74,84
Excess fat	31	34,1	25,15 – 44,27
Waist circumference			
Healthy zone	73	80,2	
Risk zone	18	19,8	
Girls = 72			
Age	12,87	1,85	10,00 – 18,00
Body mass	56,51	13,91	32,00 – 101,00
Body height	1,63	0,09	1,43 – 1,85
IMC	21,3	5,23	13,80 – 39,60
z score	0,32	1,47	-3,21 – 4,24
Waist circumference	70,98	10,75	56,00 – 116,00
Neck circumference	33,12	3,15	28,00 – 44,00
IMC	n	%	IC95%
Normal weight	45	62,5	50,95 – 72,78
Overweight	27	37,5	27,21 – 49,04
Neck Circumference			
Normal	22	30,6	21,12 – 41,95
Excess fat	50	69,4	58,04 – 78,87
Waist circumference			



Healthy zone	39	54,2	42,73 – 65,17
Risk zone	33	45,8	34,82 – 57,26

Adami (2008) observed that 21.6% of the girls were overweight, 16.5% of whom were classified as overweight and 5.1% as obese. These results suggest that girls exhibit a significant proportion of excess weight, which is considered a positive indicator for the identification of girls who have begun the maturation period. These observations are important because, for many girls, the beginning of maturation is marked by weight change and body fat distribution. Several studies have emphasized an intrinsic relationship between maturation indicators and obesity in girls. (Himes et al, 2004; Ribeiro, 2006). Therefore, it is the role of the physical education professional to identify girls who have started to go through the period. This can allow early interventions that can help prevent or manage excess weight, promoting optimal health for this audience in this period of development.

According to Freitas (2022), adolescents classified as having complete maturation had significantly higher BMI values when compared to those who were classified as having incomplete maturation or delayed. Most of the adolescents investigated in this study had 63% of adequate weight, however, it is worrying when we look at the 37% of all those surveyed who are overweight. Santos (2022) states that, in some cases, the measurements of anthropometric variables increase according to the stages of maturation. It is important to note that weight and BMI are significant indicators for assessing the risks of numerous diseases, including cardiovascular and chronic diseases.

Table 2. Mean, standard deviation, median and interquartile values of body mass (kg), body height (m), body mass index/BMI (kg/m²), waist circumference (cm) and neck circumference (cm) and prevalence (%) according to the sex of the schoolchildren..... Porto Velho, RO. 2024.

Variables		Sex		P-value
		Boys	Girls	
Age		13,00 (11,00-14,00)	13,00 (11,00-14,00)	0,528a
Body mass		42,30 (38,60-53,60)	56,00 (45,00-65,75)	<0,001a
Body height		1.54 ± 0.09	1.63 ± 0.09	<0,001b
IMC		18,60 (16,90-21,50)	20,15 (17,37-23,80)	0,027a
z-score		0.69 ± 1.69	0.32 ± 1.48	0,208b
CC		69,00 (63,00-74,00)	69,00 (63,20-76,75)	0,780b
CP		31,00 (29,00-33,00)	33,00 (31,00-35,00)	0,001b
	n (%)	n(%)	n(%)	
Age				0,501
< 14 years	88 (54,0)	47 (53,4)	41 (46,6)	
≥ 14 years	75 (46,0)	44 (58,7)	31 (41,3)	
IMC				0,871
Normal weight	103 (63,2)	58 (56,3)	45 (43,7)	
Overweight	60 (36,8)	33 (55,0)	27 (45,0)	
CP				<0,001*
Normal	82 (50,3)	60 (73,2)	22 (26,8)	
Excess fat	81 (49,7)	31 (38,3)	50 (61,7)	
CC				0,001*
Healthy zone	113 (69,3)	73 (64,6)	40 (35,4)	
Risk zone	50 (30,7)	18 (36,0)	32 (64,0)	

a) Mann-Whitney test: represented by median and interquartile b) Student's t-test: represented by mean and standard deviation. Chi-square test = Prevalence (%) *p<0.05.

Table 2 shows that the mean age of both sexes is 13 (11.00-14.00) years. Regarding body mass, girls are highlighted, the average is 56 (45.00-65.75) kg. Regarding body height, it is important to note that boys obtained an average of 1.54± 0.09 m and girls 1.63 ± 0.09 m. Regarding PC, 81 of the students classified as excess fat, 50 are girls, where a statistically significant value was obtained (p=<0.001). Regarding CC, of the 50 students classified in the risk zone, 32 are girls, which corresponds to 64% of those classified (p=0.001).

Gemelli (2020) addresses that 13-year-old girls with the presence of menarche had an average height of 1.69 m and a median body mass of 50 kg. According to the data collected, girls who started maturing around the age of 14 tend to be taller and heavier, while girls who start the maturation period before the age of 11-12 are smaller and lighter. Thus, it can be said that the girls investigated in this study may also have menarche.

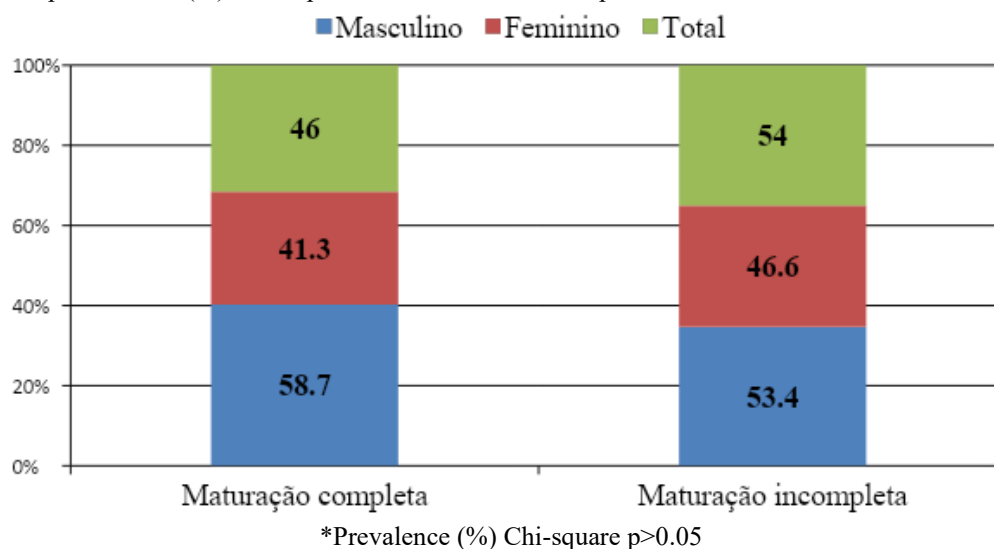
These results underline the relevance of a more detailed approach that takes into account individual stages of maturation when examining the growth and development of girls during the maturation phase. As noted by Karlberg (2002), height serves as a significant indicator of health in

adolescents, with a relationship with the stages of sexual maturation. Traditionally, during this period, boys are expected to have higher weight and height compared to girls. However, the results of this study contradict this trend with a different pattern of growth observed among the participating girls. This discrepancy highlights the complexity of the human development process and the need for further analysis to fully understand individual variations.

Regarding NC, it was identified that there was a positive correlation with gender, indicating that, in its majority, girls have an excessive accumulation of fat in this region. According to the results presented in this study, one study observed an increase in this measure in relation to the evolution of the stages of sexual maturation (Medeiros, 2014). It is notorious that, from the beginning of maturation, adolescents, especially girls, enter a period of remarkable growth.

In addition, with regard to WC, girls are more present in the risk zone. They tend to have a higher body fat percentage than boys, where they obtained a statistically significant result ($p=0.001$). This is due to the fact that the accumulation of body fat occurs faster in girls. In boys it is mainly influenced by the presence of testosterone. Therefore, girls have a greater tendency to accumulate body fat. According to Campos (2022), boys have a reduction in body fat and an increase in lean mass, while girls have an increase in the proportion of fat. This discrepancy is related to and can be explained by the actions of the sex hormones in each sex. This is a point that can be taken into account in this study.

Graph 1. Values (%) of complete maturation and incomplete maturation of females and males.



Graph 1 shows that 46% ($n=75$) of the sample reached complete maturation. Within this percentage, 58.7% (44) are boys and 41.4% (31) are girls. Of the remaining 54% (88) of the sample, which are incompletely matured, 46.6% (41) are girls and 53.4% (47) are boys. The evaluation of sexual maturation was carried out according to the criteria established in the MSD Manual (2022). To determine the stages of sexual maturation based on the age of the students, the following cut-off

point was adopted: the following values: for girls, incomplete maturation was considered < 14 years, while complete maturation was defined ≥ 14 years of age or older. For boys, incomplete maturation was characterized as <14 years, while complete maturation was ≥ 14 years of age or older.

It is noted that 54 adolescents, 46.6% girls and 55.4% boys, were classified as having incomplete maturation, where it can be deduced that the signs of sexual development of the investigated patients are still in progress, but have not yet reached the stage of fullness in terms of anatomical and functional that are necessary for reproduction. Several studies have some characteristics, in boys the enlargement of the penis and testicles are presented and in girls the development of breast tissue (Oliveira et al, 2023), the appearance of female and male pubic hair (Marshall WA, Tanner, 1969), occurrence of the first menstruation (Gemelli, 2020) and among other characteristics (Sawyer, 2018; Ré, 2011; Santos, 2022).

Table 3 – Association between female gender and body mass index (BMI), neck circumference (NC) and waist circumference (WC) variables in adolescent schoolchildren, 2023, using Logistic Regression Analysis.

Variables	β (Standard Error)	Gross Odds Ratio (95% CI)*	p	β (Standard Error)	Adjusted Odds Ratio (95% CI)*	p
Age						
Constant						
IMC						
Normal weight		1			1	
Overweight	0,053	1,06 (0,56 -2,00)	0,871	0,092	1,10 (0,57-2,10)	0,782
Constant	-0,254			-0,392		
CP						
Normal		1				
Excess fat	1,481	4,40 (2,27 – 8,53)	<0,001	1,571	4,81 (2,43-9,54)	<0,001
Constant	-1,003					
CC						
Healthy zone	1,177	1			1	
Risk zone	-0,602	3,24 (1,62 – 6,50)	0,001	1,228	3,41 (1,69-6,91)	0,001

*Adjusted for age and sexual maturation

According to the results of Table 3, which deals with the association between the female gender and the variables: BMI, NC and WC, it was observed that there was no significant correlation with BMI ($p=0.782$). However, in relation to NC, a positive association was identified, with girls presenting a higher NC in the adjusted ratio of 4.81 (95% confidence interval: 2.43-9.54), reaching statistical significance ($p<0.001$). In addition, a significant association with WC of 3.41 (1.69-6.91) was found, also demonstrating a significant correlation ($p=0.001$). The findings show that there is a positive association between the female gender and the measurements of NC and WC. This



information suggests that the girls in this study tend to have higher WC and NC measurements compared to boys in the period of sexual maturation.

Regarding PC, there are few studies that address this anthropometric measurement with adolescent girls. In this study, we observed that older girls tend to be taller and heavier. In addition, after the analysis of the confidence interval, we found that the measures evaluated were correlated with age. Table 3 shows that NC is significantly linked to gender ($p < 0.001$), i.e., girls in the maturation phase tend to have higher NC.

The amount of fat in waist circumference in girls can vary significantly according to multiple factors, including age, stage of maturation, physical activity levels, eating habits, and genetics. Waist circumference is a measure that is often used in assessing abdominal fat accumulation and assessing the risk of certain health conditions, such as cardiovascular disease and type 2 diabetes. (Kurtoglu et al, 2012). Ortega et al (2021), longitudinally followed a group of 90 girls, aged between 8 and 15 years, over a period of four years. The results of this study suggest that girls who had higher adiposity in childhood had early thelarche (breast development). This finding suggests a possible influence of early adiposity on the process of sexual maturation in girls.

The authors emphasize the health promotion and prevention of adolescent students and can be important instruments for the process of reducing excess weight in this age group. It is the role of the Physical Education professional to monitor and plan activities adapted to the students' context, recognizing that excess weight is a risk factor for numerous diseases and that the consequences of these can interfere with other stages of life (Ferreira et al, 2018). Therefore, it is essential that there is the implementation of early interventions in these circumstances.

CONCLUSION

Based on the data analyzed in this study, it is evident that girls had higher WC and NC measurements during the period of sexual maturation, different data when looking at boys. This study highlights the results of other studies, affirming the association between maturation indicators and obesity, especially in girls. It is important to recognize that, with the beginning of the maturation period, adolescents go through a period of spurt, where significant growth is present.

In this context, it is of paramount importance that Physical Education professionals are attentive to their students so that they can identify the beginning of the maturation period, whether early or late. Early identification enables the application of effective health promotion strategies, aiming to avoid triggering problems during this period and ensuring that these young people reach their maximum potential for physical and psychosocial development.

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Educational dynamics and practices in diverse contexts: A comparative study between Brazil and Portugal

 <https://doi.org/10.56238/sevned2024.014-028>

Joel Augusto Moura Porto¹, Ronaldo Santos Guedes², Rita de Cássia Ramos Queiroz de Freitas³, Lília Raquel Fé da Silva⁴, Mateus Lima Coutinho⁵ and Vivianne Cambuí Figueiredo Rocha⁶

ABSTRACT

This chapter provides a comparative analysis of educational institutions in Brazil and Portugal, focusing on practical observations from on-site visits. Highlighting the transformative role of teaching internships, the study explores how these experiences enrich both interns and seasoned educators by fostering innovative teaching practices. In Portugal, we examined the Music Conservatory of Coimbra, Avelar Brotero Secondary School, and Infanta Dona Maria Secondary School. The Music Conservatory, founded in 1986, exemplifies inclusive music education with specialized teachers and facilities designed for optimal learning environments. Avelar Brotero Secondary School offers diverse courses and vocational training, emphasizing practical learning and international educational exchanges. Infanta Dona Maria Secondary School, established in 1918, stands out for its rigorous academic standards and comprehensive facilities, supporting students with diverse needs and promoting environmental awareness. In Brazil, we focused on the State Polyvalent School of Amaralina in Salvador, established in 1973 under the PREMEN program. Despite its location in a challenging neighborhood, the school provides a nurturing environment with modern facilities, practical workshops, and inclusive educational programs. This comparative exploration offers valuable insights into educational dynamics, infrastructure, and cultural impacts in Brazil and Portugal, contributing to a deeper understanding of effective educational practices within diverse global contexts.

Keywords: Education, Comparative analysis, School structures, Portugal, Brazil.

¹ Master's in Genetics and Molecular Biology
Institution: Universidade Estadual de Santa Cruz
E-mail: joelaugustomp@gmail.com
ORCID: <https://orcid.org/0000-0002-0121-1403>

² Undergraduate in Agronomic Engineering
Institution: Universidade Federal do Recôncavo da Bahia
E-mail: ronaldosantos.guedes@gmail.com
ORCID: <https://orcid.org/0009-0004-5447-7266>

³ Specialist in Chemistry Teaching
Institution: Colégio Venda Nova Do Imigrante
E-mail: ritarqfreitas@gmail.com
ORCID: <https://orcid.org/0000-0002-3931-7975>

⁴ Doctorate in Animal Science
Institution: Universidade Federal do Piauí
E-mail: liliaraquelf@gmail.com
ORCID: <https://orcid.org/0000-0001-9831-833X>

⁵ Specialist in Natural Sciences Education
Institution: Federal University of Piauí – UFPI
E-mail: teulimma@gmail.com
ORCID: <https://orcid.org/0000-0002-3931-7975>

⁶ Doctorate in Veterinary Medicine
Institution: Universidade de São Paulo
E-mail: salvavi@yahoo.com.br
ORCID: <https://orcid.org/0000-0002-0509-0311>



INTRODUCTION

The teaching internship plays a crucial role as a mediator between the university and the schools. The interaction between the intern and the full-time teacher benefits both: the intern gains from the experience of the veteran teacher, while the teacher has the opportunity to reassess their methods in light of the innovations brought by the intern.

Given the importance of this internship, an effective analysis tool is necessary to minimize possible errors. Especially in the cultural aspect, it is essential to distinguish between facts and personal inferences of the observer, ensuring that conclusions are based on accurate observations and not on cultural biases.

This work proposes to observe the functioning of educational institutions, collecting information from schools in Brazil and Portugal. The observation process is an analysis based on facts that lead to a pertinent conclusion. Thus, a very effective filter is necessary during the information capture, as this is the basis upon which the entire work can and should be built. If disconnected and/or without solid foundations, it is not possible to reach a common multiple among the data collected from the work.

The data presented in the report concern observations made at Portuguese schools located in the city of Coimbra: Music Conservatory of Coimbra, Avelar Brotero Secondary School, and Infanta Dona Maria Secondary School, and observations and interventions at the Brazilian educational institution: State Polyvalent School of Amaralina, Salvador, Bahia.

In light of the above, the objective of this work is to report the physical structure and the composition of the teaching staff of Brazilian and Portuguese schools based on on-site observations. Additionally, through the teaching internship at a Brazilian institution, it seeks to correlate the observations made in the classroom with the general aspects of the school.

VISITS TO PORTUGUESE SCHOOLS

By closely monitoring an educational institution, it is possible to understand the mechanisms necessary for the proper functioning of a school. The main objective was to directly observe the educational structure of the school, including the admission processes for students and teachers, the quality of education, and the internal organization of the school (administration, secretariat, library, sports area, laboratories, canteens, etc.).

The Portuguese schools, located in the city of Coimbra, were visited from May to June 2014.

MUSIC CONSERVATORY OF COIMBRA

The Music Conservatory of Coimbra is a public institution of Specialized Music Education. At the time of its creation, it integrated two private music schools existing in Coimbra, assuming the official continuation of these schools' pedagogical actions.

Figure 1. Facade of the Music Conservatory of Coimbra.



Source: Authors.

It began its educational activities in February 1986, in the Cerca de São Bernardo building on Ladeira do Carmo, provided by the Coimbra City Council. In October 1987, it moved to the building of the old Maternity Hospital, near Sé Velha, through the cession of the Coimbra District Board. During the school years 1996/97 to 2002/03, it also used the facilities of the Coimbra Institute on Rua da Ilha, following a protocol with the same Institute and the University of Coimbra.

Since the beginning of the 2003/04 school year, it has been temporarily occupying part of the facilities of Secondary School Dom Dinis on Rua Adriano Lucas, until the completion of the planned new building. Based in Coimbra but extending its influence throughout the Central Region — directly or through affiliated music schools — the Music Conservatory of Coimbra is guided by the following principles:

- To promote the learning, practice, and enjoyment of music in the city of Coimbra and the Central Region;
- To contribute to the integral formation of its students, both as citizens and musicians;
- To promote the professional dignity and training of its teaching and non-teaching staff.

The teaching staff of the Conservatory consists of 107 teachers and 135 generalist teachers. The latter are those who can teach more basic subjects, such as music history and music theory. The student-to-teacher ratio is around 11.



There is no strict separation among students in terms of knowledge. That is, students are not rigidly divided, and teachers can, if they see fit, place students in different environments, facilitating accelerated development. The Conservatory also accommodates 3 autistic students and one student with Down syndrome in its dance classes, showing the school's openness to society in various aspects and its commitment to teaching music to all.

The Music Conservatory of Coimbra comprises students from various social levels. The school has a teachers' room, individual offices, and a secretariat. It serves students from 30 different localities around Coimbra, accompanying them from primary through secondary education. There is also a section for professional courses funded by the European Union, which accepts students who join the conservatory at the ages of 15 or 16.

In Portugal, there are seven music schools, one of which is in Coimbra. At the entrance of the conservatory, there is a grand piano that students can use during breaks or free hours. It has needed repairs three times due to improper use, but the school insists on keeping the piano in the hall to promote an education where students learn to respect the instruments they work with. Additionally, the school aims to indirectly teach the concept of collective education, where students learn to share an object for the rational use of all.

Dance classes last 90 minutes per day. Teaching dance remains a challenging task for the conservatory, as it requires a more suitable infrastructure and a level of student commitment that is not yet part of the collective consciousness of the learners. According to the teacher, dance professionals at the Conservatory demand a lot from students, and the available hours for the curriculum units are still insufficient. During the visit, it was possible to visit two dance classrooms for the 6th and 7th grades.

In terms of structure, the Music Conservatory of Coimbra is highly committed to maintaining its quality standards in all aspects. The rooms are designed to manage the acoustic waves circulating in the environment. None of the walls in a room are parallel to each other; they are arranged so that sound is reflected and then directed to the floor. The flooring is made of appropriate material, with a lot of wood used throughout the music school to ensure proper acoustic insulation due to the large number of classes and noises from various sources.

The construction of a new structure for the conservatory cost the government around 27 million euros, the most expensive in Portugal. Recently, an auditorium was built for larger public performances, with 374 seats, of which 8 are for people with reduced mobility. Initially, due to the good structure of the environment, the school used it for any recitals, whether open to a large audience or not. After some time, they concluded it was not ideal to use it for small events, as it was unnecessary, and the environment would become too formal for some types of presentations.

There are 60 classrooms for various instruments and 15 larger classrooms for collective studies. Student evaluations are conducted through public presentations. Behavioral standards are not assessed, as students, according to the teacher, do not present any relationship difficulties. Therefore, the school has never had a disciplinary process in its history.

Figure 2. Auditorium of the Music Conservatory of Coimbra.



Source: Authors.

During his speech, the professor laments the lack of education for classical music in the school. In other words, he proposes a more open education to culture in general. "Coimbra does not live culture intensely," says the professor about the teaching of arts in the city. Next year, a course focused on listening to lyrical music will be created, with the aim of demonstrating new horizons to students in terms of music types.

Education is still very much centered on the European cultural cradle. The peculiarities of American, African, and/or Asian trends are still not presented to students as they should be. The professor discusses the possibility of replacing music history with art history. Showing students only the perspective of music would drastically reduce the contributions of other artistic languages and compromise the historical-cultural sense of the context from which such expressions emerge.

The school provides classes for instruments that are relatively expensive compared to the economic reality of many students. Since it is necessary for students to practice their instruments, the Conservatory makes instruments available for students to use daily. Those that are difficult to acquire, such as bassoons, can be rented. The cheaper ones cost around 2000 euros, reaching up to 18000 euros. To address this situation, the school sets a symbolic fee of 25 euros per month for the student to use the instrument.

The Conservatory has very relevant proposals for the study of performing arts in Coimbra. According to the professor, "There is no theater in Portugal. It is still not a properly schooled area." Based on this statement, he continues by saying that theater is one of the future projects for the



Conservatory, not necessarily for the near future, but it is a problem that the school intends to remedy, at least in the city of Coimbra.

AVELAR BROTERO SECONDARY SCHOOL

Avelar Brotero Secondary School is one of the highest-quality secondary schools in the country. The practical component is a strong aspect of this educational institution. Here is a journey through the history of this great reference in Portuguese education. In 1997/98, the school lost its younger population, the dearly missed elementary level, much to the regret of many, as it was through this that it had acquired its specific character. Brotero School would thus become part of the group of educational establishments that would achieve the status of exclusively secondary schools. From then on, Brotero also saw a more entrenched recovery of its technical focus. Indeed, the trend of introducing technological/professional courses to facilitate immediate insertion or promotion of students in the workforce has been increasing.

Today, in addition to the scientific-humanistic courses, including Visual Arts, that Brotero offers within the scope of day Secondary Education and night recurrent Education (which has been in effect since the nineties and almost entirely converted to the so-called Adult Education and Training System), this educational institution offers an attractive range of Level 3 Professional Courses in sectors such as Electronics, Automation, Economy, Accounting and Management, Informatics, Multimedia, Electrotechnics, Metallurgy and Metal Mechanics, Refrigeration and Air Conditioning, Renewable Energies, Civil Construction, Fashion Design, Environmental Management, and Secretarial Studies.

In the workshops, traditional areas such as Auto Mechanics, Ceramics, Tapestry, Sculpture, Electrotechnics, Civil Construction/Woodwork are still in operation. Simultaneously, Brotero continues to promote its Center for New Opportunities, which, interestingly, has brought many of its former students back to school. Today, the school has 42 active staff members. The teaching staff consists of 138 teachers, having been around 280 teachers in previous years.

Starting the visit, at the entrance of the building, you can see works by the students created in their art classes. Many of these pieces fill the space of the front hall. Not far away is the students' bar, where they can have something to eat during their breaks, especially healthy options. There is intense care regarding what is sold in this space, as it is a very frequented environment by the students. Interestingly, there, for example, students can watch the Bar TV, whose quality has earned the 10th, 11th, and 12th-grade students awards in multimedia competitions.

The school has undergone many structural changes. Today, all the building spaces are welcoming to students, adhering to the highest quality standards. The Brotero structure has been very well thought out, and today the students can enjoy very good quality classrooms and laboratories.



Where the library is currently located, for example, was, six years ago, a volleyball court. From this, we can infer the amount of work involved in the school's investments.

As noted during the visit, this is an educational institution where dedication, especially from the teachers, is a significant characteristic concerning everything being developed there. During this visit, we met a total of three teachers who volunteered to continue their work even after retirement.

The library structure is very comfortable and welcoming for the students. The school's concern to keep students focused during important moments for acquiring and solidifying new knowledge is evident. The space is very well structured with a mezzanine, where students have an adequate space for free drawing. There are also some computers with internet access.

The school also engages in partnerships. For example, physical education classes, such as swimming, are held at the pool complex across the street from the school.

The school building also includes a space for psychological and vocational guidance, which is a very important component, especially in a school with a strong practical aspect. Regarding the school's links, many companies introduce their projects to these students. This makes the students more involved in their areas as they see their work being directly applied.

The school's laboratories are quite versatile; they are spaces where various types of technical work can be practiced, especially the electronics laboratories. These spaces are very well equipped with excellent devices and machines made by the students themselves. Brotero students also participate in various competitions, having even gone to the Netherlands as a reward for their excellent work. They have won first place twice with the electrotechnics award, showcasing the quality of the school, teachers, and students at a national level. Physics, electricity, and auto mechanics laboratories were visited, one of which was holding a class with the 7th Automatism and Command class of Avelar Brotero School, composed, not intentionally, solely of boys.

The teacher commented that some aspects of the school's infrastructure do not meet the expected standards. One example is the floor in some areas or the lighting in some classrooms. Some teachers complain that when they use the projector, they cannot dim the classroom lights.

The school also offers exchange programs with several countries, namely England, France, Italy, the Netherlands, and Spain. Students, especially those who wish to learn other work techniques in their fields, thus have the opportunity to mix experiences, besides gaining a different cultural experience and an adventure associated with so many learnings.

INFANTA DONA MARIA SECONDARY SCHOOL

Starting the visit, we went directly to the library to get acquainted with the collection of books, magazines, and educational films the school held. To our surprise, we found a collection of past exams, which was somewhat new to us, as, at least in the reality of the Brazilian education



system, this is not common in school culture. Brazilian students, in general, do not have access to tests and exams from previous years.

We also noticed that the students present were studying with great concentration, not getting too distracted by our visit. There were about eight computers available to the students for school research or other needs. Next, we visited the sports areas, which included a covered pavilion for various sports (futsal, basketball, rock climbing, etc.). There were also some mats on the floor, leading us to conclude that sports such as judo and karate might be offered in physical education classes. We also saw another sports area, located outdoors, where activities like volleyball and basketball could be practiced.

In addition to presenting the school's structure and its functioning, the director, Dr. Ernesto Paiva, explained the history of Infanta Dona Maria Secondary School. The school was founded on July 14, 1918, as Coimbra Women's High School, but it was only on February 19, 1919, that it began its teaching activities in building number 111 on Avenida Sá da Bandeira, a building that still exists today. In the same year, it was renamed Infanta Dona Maria National High School. In 1948, the High School moved to a building that it still occupies today, located next to the Municipal Stadium of Coimbra, an almost deserted area at that time. The building initially had amphitheatres, drawing rooms, laboratories, a gymnasium, a canteen, classrooms, offices, a teacher's room, the principal's office, a library, a playing field, and a bar.

Although it was a new building, it did not meet the needs of the High School, as there was a lack of rooms and space. In 1963/64, work began to expand the High School's space. These works provided eight more rooms, an amphitheater, four offices, and improved the conditions of the Physics, Chemistry, Natural Sciences rooms, and the canteen. Additionally, the building also had a chapel.

According to the teacher, the library for its time was notable due to the number of books. The laboratories initially had some material and, over time, became better equipped. The High School's subjects were the same as those of the male High School, but with adaptations in areas such as manual work, which was mainly domestic tasks. The existing subjects were: French, English, Moral, Family Government and Health, Economy and Art, Notions of Political Education, Common Law, Hygiene and Childcare, White Clothes, Embroidery and Techniques, Hats, Flowers and Applied Art, Cooking, Physical Education, and Choral Singing. In Physical Education, they covered basketball, volleyball, and dance. Besides these activities, students also engaged in extracurricular activities.

The school still has a place for selling school materials and a photocopier where students can make copies of their materials at affordable prices. We also visited the canteens. Due to the time we were there, the cafeteria had already closed its routine activities. However, according to the director,



the very well-maintained canteen offers a rich healthy menu, which reinforces the school's quality not only in terms of education and infrastructure.

By closely observing the school's structure, we verified that all classrooms are equipped with video and overhead projectors and individual desks for students. Among other rooms, there was a special one where educational lectures by school guests, usually university professors, especially from the University of Coimbra, are held. This is significant since the school's focus is on integrating students into higher education. Therefore, these lectures have a motivational background, maintaining the school-university connection, which is a primary reason for the high number of students interested in higher education.

A survey conducted at the school showed that about 83.5% of students go on to higher education, which is not entirely surprising. Generally, students from this school achieve a global average between 16.0 and 19.0. Proof of this is that one student received a full scholarship to study at the Catholic University of Lisbon, known for having one of the highest tuition fees in the country. The student was invited due to her brilliant academic performance, making her stand out among her peers.

Another case was a student, from 12^o D, who won first place in the National Final of the Biotechnology Olympics, held at the School of Biotechnology in Porto on May 31, 2013. This confirms the quality of the school's educational system and the level of student learning.

To achieve this, the teachers are highly qualified, prepared to face the accelerated daily pace of classrooms. The school's rigorous education system requires teachers to stay on top of their activities, risking falling behind the fixed schedule imposed by the Portuguese Ministry of Education. The curriculum is easily accessible on the school's website, allowing students' families to stay informed throughout the school year.

Additionally, teachers need to be qualified not only in scientific content but also to address the needs of students with different learning paces or physical-visual limitations. We confirmed this by visiting the visual impairment room, which had appropriate equipment for students with low vision. There were several posters on the walls with phrases written by visually impaired students. The Infanta Dona Maria Secondary School is also a reference in accessibility for visually impaired students.

Teachers need to be prepared not only for visually impaired students but also for those whose learning pace is slower than the school's average. These students receive more attention, requiring teachers to adapt content to a language and timeframe that allows them to learn as effectively as others. Teachers are rigorously selected through competitions held by the Ministry of Education. They report initial difficulties adapting to the school's accelerated pace. Teachers must maintain a high level of discipline and continue to qualify due to the high level of classroom questioning.



Reinforcing the students' commitment to their studies, when a student leaves the classroom for a few minutes, they ask the teacher to repeat what was missed. Naturally, when teachers need to be absent, students demand makeup classes. This part of the school profile impressed us.

Describing the school's various environments, we must mention the excellent biology, physics, chemistry, and descriptive geometry laboratories. In the chemistry lab, we witnessed an extracurricular activity conducted voluntarily by the subject teachers to prepare students for the Chemistry Olympics that would take place later that year.

The teachers' willingness and the significant participation of students preparing for this event impressed us. The dedication and commitment from both sides (teachers and students) were evident in the students' focused attention in these classes, which could potentially win another medal for the school. The quality of the laboratory equipment and the well-spaced benches for pairs or trios, showing adherence to safety norms, reflects the school's concern not only for education but also for overall safety during practical classes.

The biology and geology labs had real-scale anatomical models, plant samples, and fragments of various rocks. Unfortunately, we couldn't visit the descriptive geometry lab, but given the school's standards, we expect that students, especially those with difficulty visualizing in three dimensions, have their needs met through hands-on contact with geometric solids.

Around the multipurpose laboratories, various objects from different fields of knowledge are displayed. Taxidermy animals, old electronic devices, and exhibits of artistic paintings fill the space of these so-called mini-museums of natural history, science and technology, and arts.

Continuing the visit, we had the opportunity to see the area where an outdoor library will be located, a proposal we found very interesting as it brings the world of books and knowledge to new environments. We also visited the Fernando Azeiteiro auditorium, named in honor of the late former director, a person of great importance to the school's work. It is said that he dedicated himself to school activities even when his health did not allow it. Without a doubt, he is an example of someone who strove to maintain the school's educational standards among the best in Portugal.

Concerned with maintaining the architectural aspect of the time when the school was founded, the management team avoids any changes to the facade that might alter it, which would make it lose all its originality and tradition. The most recent renovations included an expansion, with the construction of more classrooms, an IT laboratory, access to locker rooms and cafeterias, and a group room, where students generally go when they have no classes.

Like all educational institutions, the Infanta Dona Maria Secondary School has a teachers' room. The innovation this time is that there are specific rooms for research groups of educators. We had the opportunity to visit the Meeting Room of Excellence, where the entire school's pedagogical council meets. This space was created where the library used to be.



Curiously, along the corridors, we noticed several bulletin boards displaying many activities or occasional projects developed by students, which are frequently posted there for easy viewing. This shows that students are relatively consistently engaged in various types of tasks, demonstrating that the dynamism in regular classroom exercises ensures greater effectiveness in knowledge acquisition.

The school also presents an ecological consciousness that transcends the classroom limits. Students adopt a green policy through reeducation by engaging in recycling activities and follow a conduct of preservation not only of the space where they daily interact with their peers but also of the extracurricular environments.

Regarding humanistic aspects, the school is also prepared to attend to students who do not meet the school's behavioral standards. When something conflicting occurs in class, the student is directed to the Conflict Mediation Office, a room where a psychology professional attends to the students to express the reasons that led to their indiscipline during class. This way, it is possible to more directly clarify any difficulties that may arise in class.

Considering various socioeconomic aspects, the school has a special program for students whose families have low income. This means that financial difficulties are not an obstacle to dedication to school life. The benefits of this program include free daily meals in the cafeteria, the purchase of school materials with the school's own funds, and the possibility of making free photocopies within the school's premises. All this support is provided discreetly so as not to embarrass the benefiting students.

To enroll in the school, there are a series of prerequisites that must be strictly followed. One of them, for example, refers to the proximity of the candidate's residence to the school. Those who do not live far from the school's location are given priority. Those who have certain difficulties are also prioritized over others. Additionally, there is no distinction or preference for any nationality. At Infanta Dona Maria Secondary School, students from all over the world are welcome.

Besides other activities, the school also has a theater club, an adventure and tourism club, and a health project. Students frequently participate in Olympics and internal competitions, both nationally and even internationally, in various fields of knowledge.

To not overlook the negative points, the director emphasized that, even though the school stands out in Portuguese secondary education, some aspects need improvement, such as teachers' self-esteem and their replacement when they need to be absent. There are no substitute teachers for such situations, leading to an accumulation of extra classes and the inevitable deviation from the school's teaching plan. Another issue mentioned by the director was the reduction of class numbers (from four to three). This makes the study pace even more intense than usual, along with more rigor in content delivery.



Obviously, the negative points presented are common in the routine of almost all schools. Despite these details, we found an educational institution that impresses us by implementing its lesson plan and fulfilling the Ministry of Education's teaching proposal. In addition to engaging students in school life, it motivates them to pursue academic paths, encouraging the deepening and maturation of their knowledge. In summary, Infanta Dona Maria Secondary School is, indeed, a teaching reference for institutions that value educational quality and the appreciation of students as individuals.

VISITS TO BRAZILIAN SCHOOL

The visit to the school allowed for direct contact with an educational institution, providing a practical insight into how the school operates. Understanding the infrastructure, as well as the faculty and staff of a school in general, is crucial for gaining a better understanding of a school building. This allows one to observe the atmosphere in various areas of the school, which is important for understanding the dynamics among the individuals who contribute to its functioning. Such observations replace any classroom instruction, as real-world contact occurs solely through practical experience. The reception by the school was excellent.

The State Polyvalent School of Amaralina is located in the Northeast neighborhood of Amaralina, in the city of Salvador. Known for drug trafficking and violence, there is a general tendency to create a prejudice (using the word here in its real sense) that all residents of this neighborhood share the same profile. However, the students we interacted with at the school were extremely friendly and eager to learn.

STATE POLYVALENT SCHOOL OF AMARALINA

History

The Polyvalent School of Amaralina was established by decree 23273 on February 28, 1973, as published in the Official Gazette of the same date. However, it was only inaugurated on May 14 of the same year. At that time, the P.S.A. (Polyvalent School of Amaralina) was under the direction of Professor Ana Carolina. The school unit was created under the PREMEN (Expansion and Improvement Program for Education, in Portuguese), and teachers were trained through intensive improvement courses provided by the federal government over a period of one year.

Figure 3. PSA school building facade.



Source: Authors.

At the end of the course, teachers were hired to work at the Polyvalent Schools spread throughout the national territory. In the state of Bahia, many polyvalent schools were established, including three schools of this size in Salvador: Polivalente do Cabula, Polivalente de San Diego (in the Lower City), and the mentioned school unit, Polivalente de Amaralina. These were small schools with 08 classrooms, science laboratories, a school cooperative, student council, library, reading room, sports courts, and most importantly, four workshops: Industrial Techniques, Commercial Techniques, Agricultural Techniques, and Home Economics, which prepared students for the job market.

The school operated in three shifts, with regular classes and schedules. In addition to the principal and vice-principals, the staff included professionals (qualified teachers) from the Educational Guidance Service (SOE), supervisors, area coordinators, shift coordinators, and support staff in each classroom. There was also a choir conducted by Professor Stella Dubois (who also composed the school anthem) and a school band.

When inaugurated, the school was neighbored by Carlos Sant'Anna School, Pedro Tenório de Albuquerque School (currently C.S.U.), and several residences in front of it. There was also a beautiful garden and a vegetable garden where herbs, spices, and legumes were cultivated for consumption by the school community.

Figure 4. Students during break time.



Source: Authors.

In a brief summary, it is worth highlighting some professionals who have been part of EPA since 1973, such as directors: Ana Carolina, Felicidade, and José de Lourdes (in memoriam), Maria de Assis, Célia Correia, Dairlene, Ozita, and Nilo José (current); vice-principals Cantídio, José Petronílio, Heloísia, Noélia, Suzele, Neuza, Florice, Maria das Mercês, Neyde, Arlete, Marilene, Cristina Pontes, Meire, Nadja, Cristina Prates, Zeneide, Regina, Juracema, Jeremias, Arailde Almeida, and Walkyria Azevedo.

The school also counts among its current and former staff: Adailton, Cremilda, Lucia, Lucidia, Ivete, Olegário, Alda, Wolfran, Beatriz, Marilena, Terezinha, and Jovino (in memoriam), Justina, Augusta, Maria do Nascimento, Maria de São Pedro, Rosa, Celina, Vanice, Hamilton (in memoriam), Laura, Hilda, Silvia, Marinalva, Zely, Iraildes, and Leonia.

In 2012, the EJA Formative Time III – Axes VI and VII – Youth and Adult Education Course for High School formation was implemented. Axis VI – subjects in Language, Humanities, Arts, and Occupational Activities. Axis VII – subjects in Exact Sciences, Biological Sciences, Arts, and Occupational Activities. On May 3, 2013, Authorization Act No. 022346/08/2013 for High School Education was published.

PHYSICAL STRUCTURE AND STAFF

The State Polyvalent School of Amaralina is a high school institution physically comprised of 12 classrooms, a cafeteria, an administrative office, a library, an auditorium equipped with a projector and computer, and well-maintained bathrooms.

Figure 5. School courtyard.



Source: Authors.

There is also a teachers' lounge where each has their own locker, adjacent to a restroom specifically for them, along with shelves containing specific materials such as books used in Adult and Youth Education.

In the school courtyard, there is a very pleasant space for leisure. In total, there are two flower beds that bring a bit of nature into the school's internal space. Although not a large school, the available space is quite enjoyable for everyone.

The State Polyvalent School of Amaralina was recently renovated. Right at the entrance, it is evident that the structure is well-maintained, which gives a sense of comfort to those on the school premises. A notably significant aspect observed was the good relationship among the school staff across various departments. This is not trivial at all, as the dysfunction of many schools often stems from the lack of interaction among the school's own staff members.

Figure 6. Classroom at the school.

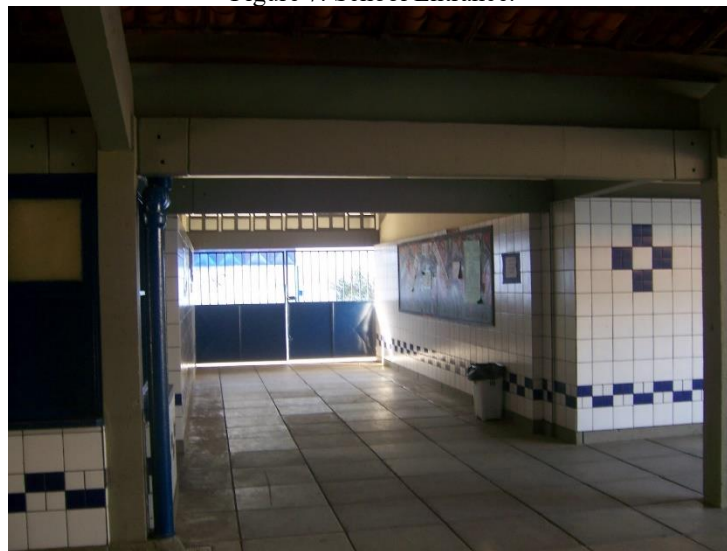


Source: Authors.

School Safety is also an important point to raise. The location of the school indicates a relatively risky environment. The student body, in turn, is not far behind, especially considering the evening class with students whose profiles are not the easiest to manage. Therefore, security guards are present, fulfilling their role adequately.

In general, it is a welcoming school where students indeed find foundational education and an ideal socialization space. The reduced number of students in the evening session also facilitates a familial atmosphere among the students themselves.

Figure 7. School Entrance.



Source: Authors.

In 2015, the school had 25 teachers, including 3 interns. The evening session consists of 16 teachers.

FINAL REMARKS

This comparative study of educational institutions in Brazil and Portugal reveals valuable insights into the dynamics and practices of education in diverse contexts. The schools visited offer a wide range of physical structures and educational focuses that reflect their local realities and commitments to academic excellence.

In Brazil, the State Polyvalent School of Amaralina, located in Salvador, stands out for its dedication to providing quality education despite the surrounding socio-economic challenges. With modern facilities and diverse educational programs, the school demonstrates a clear commitment to the holistic development of its students.

In contrast, the schools visited in Coimbra, Portugal, such as the Music Conservatory of Coimbra, Avelar Brotero Secondary School, and Infanta Dona Maria Secondary School, emphasize academic excellence and the diversity of educational programs tailored to the varied needs of



students. These institutions have robust physical structures and specialized resources that support an enriching learning environment.

Teacher training emerges as a transformative element in both countries, facilitating an exchange of experiences between interns and seasoned educators. This interaction not only enriches the educational environment but also promotes innovations in teaching methodologies, preparing future educators for contemporary challenges.

Despite the successes observed, both contexts face distinct challenges. In Brazil, overcoming socio-economic barriers and ensuring school safety is crucial. In Portugal, the shortage of teachers and increased workload are current concerns that demand effective solutions. The recommendations arising from this study emphasize the importance of sharing best practices and experiences among educational institutions, promoting inclusive and equitable education. Continuous investments in educational resources, teacher training, and inclusive policies are essential to strengthen the educational systems in both countries and beyond.



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