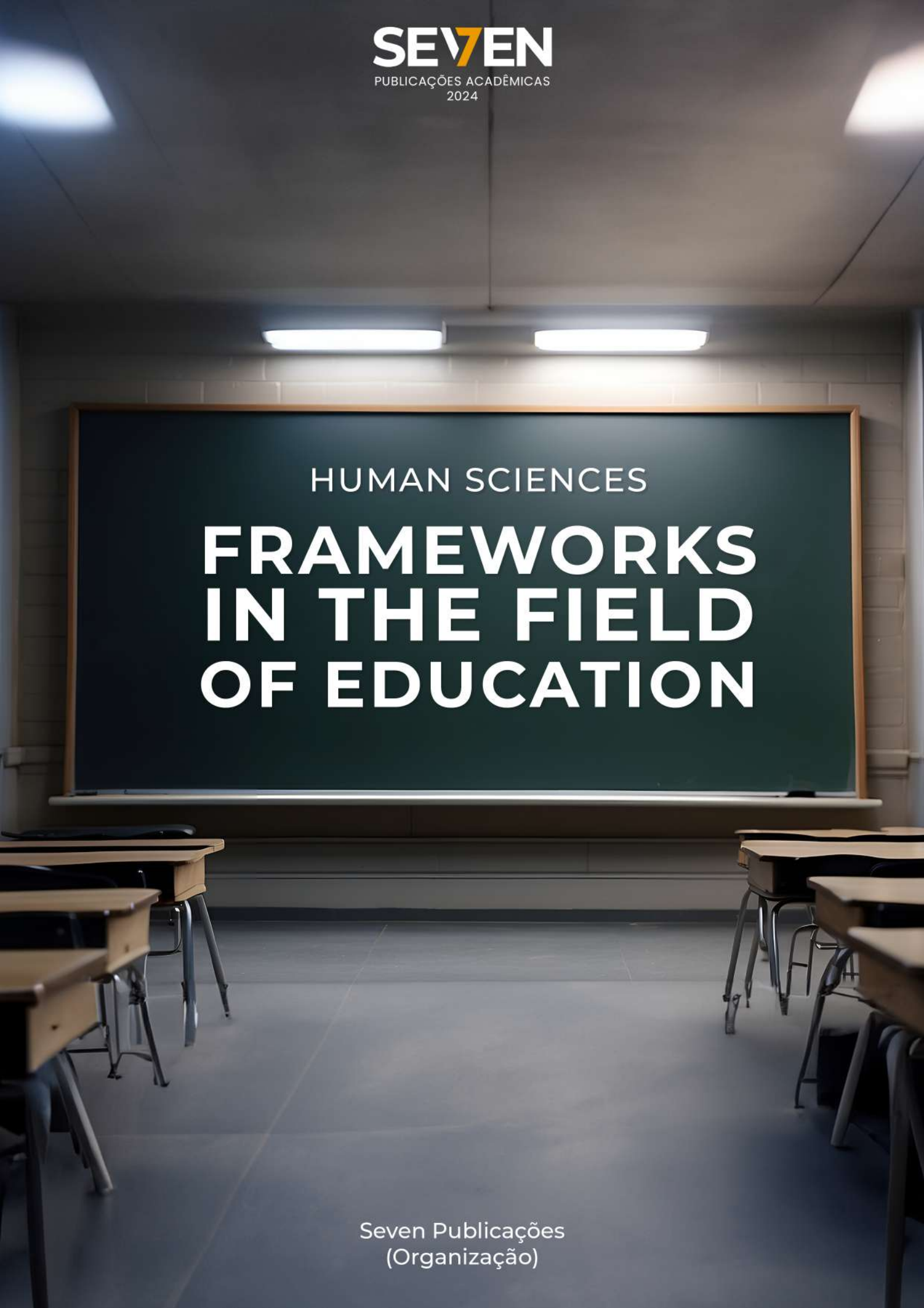
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SUMMARY

Beyond the curriculum: The formative perception in spaces outside the classroom

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ABSTRACT

The creation of the school, as a space dedicated to education, is undoubtedly a significant gain for the European model of society. Through it, states began to organize the time dedicated to studies and format didactic and pedagogical means to promote the acquisition of knowledge considered essential for the socio-cultural promotion of individuals, but also for productive adjustment. Considering the institutional space, this essay aims to reflect on the spontaneous expressions of students collected on flip charts. The analysis consists of understanding what is hidden from the school curriculum and presents itself as social determination in the organization of life and in the acceptance of socioculturally standardized values. The theoretical basis for the essay is Critical Theory. Methodologically, the expressions recorded between May and September were checked, using the concepts of formation, pseudo-formation, mass culture and consumer society as categories of analysis. As a result of the analysis, the essay exposes school organization and the curriculum as sites of political-economic disputes and as a means of socio-cultural adjustment to the standards determined by the control mechanisms. The implicit correlation between education and rational instrumentalization in favour of a productive dynamic is highlighted, which is inculturated in the expressions collected.

Keywords: Adjustment, Consumption, Mass culture, Critical theory.

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INTRODUCTION

It is a fact that the educational models proposed contemporaneously for the countries of the "Global South" are linked to the power of capital and this, therefore, finances public policies to implement productive projects. Thus, the performance of the student's school life is marked by time management, by the planning of educational activities, by the answers required in each curricular component for the formulation of the evaluative concept or grade, in addition to all the social pressure to "become" productive. The principles of efficiency and effectiveness are built from childhood. This dynamic applies indiscriminately to each person, with a greater or lesser degree of intensity, according to the different formative stages officially established by the levels of education.

The fact is that everyone is "evaluated" individually according to the criteria established by the didactic-pedagogical strands adopted by the schools. In this sense, the "school" institution assumes determinant standards of expectations in view of the desired quality in obtaining socially expected results. The evaluative criteria are also implicit in the same didactic-pedagogical aspects, explicitly contributing to the implementation of the training project adopted. However, it must be said that the objective conduct of the school, understood as a procedure for the development of education, affects the formation of the identity of the subjects, whether for reproduction, acceptance or critical understanding of the society in which they are immersed.

The evaluation of the formative process, proposed by the educational institution, as well as its implication in the student's integral human formation, can be expanded beyond the classroom, enhancing other means and methods of verifying the effective cultural, ethical, political, aesthetic and epistemological depth of education, contained in the Political Pedagogical Project (PPP). Thus, the importance of observing the actions and reactions of individuals in spaces intended for the free expression of ideas (also formative spaces) is highlighted, as they can reveal what guides the particular posture, in tune or in confrontation with the social context of the individual and the educational institution.

The present essay sought to make an analysis of the records collected by the volunteer project developed in the library space. It is a means of collecting records of ideas based on questions and problems formulated monthly. The questions aim to provoke the participants to express their ideas in writing, without the need for personal identification. We sought to collect the elements implicit in common sense and the scientific-philosophical spirit "incorporated" by education from spontaneity. The records from May to September 2023 were analyzed, in order to bring the student closer to topics that can be addressed beyond the classroom, without the evaluative-quantifying weight that measures or qualifies the teaching and learning process for the annual promotion of students. We sought to understand what young people aged 14 to 18 reveal when provoked in their subjectivity in an environment outside the classroom.

For the analysis, two problem-questions were based on the provocative questions: what do the student's expressions say about his/her individuality in the collective space? What perspectives are implicit in the voluntary and free expressions of high school students and what can they reveal in the sociocultural context?

Understanding what is hidden in the formal registration process of the educational institution, listing what the formative time has stimulated in each expression and thinking about what moves the intentionality of the participants can be pedagogical and didactic strategies to locate students in the culture that trains them, as well as to understand what they think and, of what they communicate. In addition, it also enhances the ethical and political understanding of the participants, referenced in the implicit values of the terms (words) chosen to communicate in writing.

The analysis was based on the critical theory of education. Based on it, philosophical reflection proposes a critical analysis of educational action. Therefore, the essay brings to the debate the concepts of "formation", "pseudoformation", "cultural industry" and "reification", which are decisive in the writings of Adorno (1996; 2020), Adorno and Horkheimer (1985) and Honneth (2018), as well as implied in the sociological analysis of Bauman (2008) and the communicative reason of Habermas (2019). The hypothesis that subsidizes the elaboration of the critical-philosophical diagnosis is focused on the understanding of media culture, which has psychologically suggested (programmed) the individual for action and reaction in the sociocultural context and has also stimulated production and consumption as implicit elements of the capitalist system.

The essay sought to reflect on how students understand and express themselves as beings of consciousness, however, marked by the culture of consumption. It also sought to anchor itself in what we define as the "dynamics of *educational praxis*", based on *observing*, *understanding* what is observed, *reflecting* on what is observed, effective *action* in the environment and evaluating the process. In this aspect, observing, understanding, reflecting and acting are articulated by continuous and permanent evaluation, which is also verified in the forms of individual expressions.

Understood as being in the process of education and training, students find themselves in the midst of a culture, both internationally and nationally, that prioritizes the development of skills and competencies, whose central purpose is to strengthen the relationships of the individual with his or her productive environment. In the eyes of critics of education, this program is responsible for constructing *contemporary reification*, objectifying subjectivity by the criterion of efficiency and effectiveness, priority criteria in an administered society.

FROM TERMS TO THE IMAGERY EXPRESSION OF THE WORLD

It is a fact that human communication has the potential to reveal who we are, what we think and feel, even if the intention to do so does not always prove to be conscious. This is one of the

expectations of the "mural" project, developed in the library space of the Goioerê Advanced Campus of the Federal Institute of Paraná, in the year 2023.

At the outset, the posture of each participant is described.

It was noticed that the gaze went through the *Flip Chart* sheet, sometimes focusing on the problem-question, sometimes identifying what was previously recorded by the colleagues. Some students unhesitatingly recorded words or symbols. Others, perhaps, due to apprehension, self-care, shyness or, internally supposing the possible award-punishment relationship (a logic that is seen in schools), passed by the mural without registering. However, those who participated left something of themselves in the terms or symbols marked. However, in the individual records, the observation of some elements of the historical-social culture was perceptible.

From the records on the wall, we moved on to the reflection on each of the words used by the participants. The diagnostic reflection sought to approximate the student's perception (or imagination) about the provocative theme and the formative purpose implicit in the intentional formulation of the problem. On the other hand, it was possible to capture in the recorded expressions the cultural components that guide individual actions and that lead to the psychological and epistemological reaction to a given problem.

The students transcribed on paper much of what is constituted in their imagination or how the world seems to them. The search for an understanding in the philosophical tradition about the imagination brought to light the proposition of Kant (1724 – 1804) that presents the imagination as "the faculty of representing in intuition an object that is not present [...]" (2001, p. 177; B151). Thus, considering the formative potential of the faculty of imagination, understood from the reflection proposed by Kant, it can be inferred that the expressions recorded were loaded with the imagistic representation of the world.

However, the current model of education has the purpose, among others, of bringing each student (subject) closer to the objects, promoting rational and/or empirical investigation. By making epistemic investigation present, education promotes the formative experience, which is configured by the conscious relationship between subject and object, mediated by historical-social and political-cultural conditions. In this logic, the subjects, when choosing the objects of study, are affected by them and construct their experience of being epistemic in order to act in society.

The philosopher of education, Olivier Reboul (1925-1992), reposes an important question that has accompanied philosophical reflection: "Is man man by birth or by education?" (Reboul, 2017, p. 23). His thought is oriented to the idea of human nature and, in view of what anthropology affirms, as well as the empiricist/culturalist and rationalist perspectives, the thinker positioned himself, based on the psyche studied by Piaget, Freud and Wallon. Having this theoretical reference, the thinker states

that "human nature is what requires to be educated; It is also what makes education not everything. Conversely, if education cannot do everything, nothing can be done without it" (Reboul, 2017, p. 26).

In this sense, if the formative process is understood beyond the classroom, that is, as the cultural and civilizing development of the individual, also understood from an "ontology of the social being" (Lukács, 2010), then it becomes evident that the human being is immersed in the culture strongly determined by the vision disseminated from the systemic logic that subsidizes social idiosyncrasy. In the Brazilian socio-cultural context, all individuals are connected to the command network of the cultural industry of the capitalist system, which constitutes an ideological means of "total integration" (Horkheimer; Adorno, 1985), that is, a dependence (heteronomy) on the determinations of capital.

In the voice of István Mészáros (1930-2017), one can perceive how spaces, outside the school environment, are decisive for the constitution of culture.

> The strategic importance of the broader conception of education, expressed in the phrase: "learning is our own life" cannot be overemphasized. For much of our continuous learning process is happily situated outside of formal educational institutions. Fortunately, because these processes cannot be manipulated and controlled immediately by the formal educational structure legally safeguarded and sanctioned. They encompass everything from the emergence of our critical responses to the more or less deprived material environment in our early childhood, from our first encounter with poetry and art, to our diverse work experiences, subject to radical scrutiny, by ourselves and the people with whom we share them, and by the people with whom we share them. of course, until we become involved, in many different ways and throughout life, in conflicts and confrontations, including in moral, political and social disputes of our day (Mészáros, 2008, p. 53).

How the analysis of this essay focused on expression or written communication, which belongs to the same linguistic-cultural tradition, semiotics[5] It was of great help to the understanding of the transcribed terms and symbols. However, Brazilian society, mediated by its institutions, uses the means of communication, instituted over time, to exert influence on the construction of existential ideas.

In addition to school education, there are other ways that social organizations employ for the subjective adaptation of the new generations to the objective standards, formulated by previous generations and essential for the maintenance of the social model. Education also has the role of deliberating and organizing social relations according to criteria formulated by the groups that

[5] Semiotics is traditionally defined as the science that studies the process of interpreting and understanding signs (signs, symbols, marks, etc.), which are implied in any action, posture or process that involves signs. Even considering the positions of the semioticians Peirce (1839-1914), Saussure (1857-1913), Hjelmslev (1899-1965) and Bakhtin (1895-1975) to be decisive, we take as a reference the understanding of signs proposed by Umberto Eco (1932-2016), through which every cultural phenomenon can be studied as communication. However, in view of the epistemological classification, we began to understand the expressions based on the syntax: which represents the form of the discourse; semantics: which understands the content of the discourse and pragmatics: which situates the context of the discourse. The analysis of the signs expressed in the murals comprises the cultural, political, economic, social and religious conjuncture, in connection with the means of propagation of information, in order to allow the understanding of what is expressed by the individual, but imprinted in him by the ideologies that maintain social relations.

establish themselves as responsible for culture and values. In each era, in every culture, different means have been employed for the adaptation of individuality to the social "model", fostered by accepted habits, customs and socio-cultural values.

The strong influence of the media and social networks on the psychosocial formation of the individual is notorious. Technologies have become a means of capturing, directing, and controlling individual desires. The algorithms collect and/or identify individual tastes and desires and continuously stimulate advertising about attractive products. This enhances consumption, where decisions leave the field of consciousness and are structured based on conformity.

It is on the being of thought and action that the adaptive forces are established for the constitution of the artificiality of intelligence, proper to the peaceful human being. Such a model of "intelligence" is programmed to control the individual so that he can think, create, undertake and plan his life, according to the given direction. This logic deprives it of in-depth socio-cultural and political-economic critique, with the purpose of reproducing the model of society, without altering social and economic stratifications. The being becomes what is allowed to it, based on models determined by hegemonic ideologies.

Immersed in a programmatic psychosocial model, individuals are led to a structure of thought and communication that is supposedly critical and free, but adapted to the social dynamics by rational functionality: the response given corresponds to the stimuli created. Each individual is given the right to formulate and express his or her own thoughts, as well as to plan his or her life itinerary, but always suggested and programmed by values that are only of interest to groups or institutions of power and control. This suggestion, which guides to functional reason, reveals what was defined by Habermas (2019, p. 629) as intellectual reification. Thought is emptied of the critical analysis of the environment and is instrumentalized in the actions programmed for the resolution of the emergency.

But how does this show itself concretely? We now describe the writings collected in the months of May and September 2023, in the mural project.

THE OBJECTIFICATION OF HAPPINESS

Taking the educational process in progress, in the midst of mass culture and institutionalized consumption, which reifies the human in its relationship with the world, the provocations, in the form of a question on the mural, turned to the collection of personal perspectives, regarding happiness, gains, losses and fear.

One of the mural's problem-questions: "what makes you happy?" had 93 participations, whose manifestations were printed, anonymously, on the *flip chart* by means of terms (words) and drawings. The analysis of terms and drawings linked the individual conception of happiness to objects, places, media programs, affinities with humans and animals, etc. Initially, it was noticed that the individual

expressions were connected to the sociocultural and political-economic ideas of the present time that affect the students.

It is evident that the individual expressions were not recorded by the students based on in-depth reflection. They said more about the moment or the primary motivation, the result of common sense and momentary and spontaneous intuition. From the observation of the participants' actions, a possible formative intervention arises so as not to allow the habit of informal expression to be marked by a superficial opinion about the problem addressed. It was noted that the expressions were close to the social context of the students and were charged with the oral tradition or the cultural expectation in progress, promoted by the massification of information and the standardization of taste.

Terms such as "fashion", "clothes", "food", "money", "movies", "sex", among others, revealed the common imaginary of facing happiness from the point of view of individual achievement, linked to the power of consumption and belonging to the social group. In the terms recorded, the implicit values of the productivist society and the consumer industry were strengthened. The expressions were disconnected from the expanded and in-depth formative process and, even in the teaching environment, revealed a bias that is probably not the one proposed by many curricular components, much less by the institutional formative curriculum.

The process of dissociation from integral formation to a life adapted to production and consumption is no coincidence. Nor is the emptying of individual and social intelligence, for the suggestive reinforcement of the artificiality of human intelligence in responding occasionally to problems. Regarding the formative aspect, dealt with in a pedagogical process and assumed by social dynamics, Adorno (2020, p. 246), in the second half of the last century, recorded that "the increase in the quantity of administrative apparatuses generated a new quality".

Bombarded by countless pieces of information spread on social networks, which stimulate the need to belong to the cultural environment, young people find themselves marked by the confusion of identity and the diversification of taste and are impelled to massively adhere to the constructed standards. For this reason, Adorno, in the text "culture and administration" (Adorno, 2020) highlights the systemic pedagogy, implicit in the managed society, which promotes the conformity of interest and taste. According to the thinker,

> The whole pedagogization of the spiritual corresponds to this desideratum. Its most visible consequence is regression and blind submission on the part of the subjects encouraged to spontaneity. It is no coincidence that the jargon of authenticity is spoken everywhere in this sphere. This jargon is not identical with old-style administrative language [...]. The jargon of authenticity, in turn, places the entire heterogeneous under a single umbrella (Adorno, 2020, p. 265).

In the thinker's interpretation, based on the Weberian analysis of "rationality", the capitalist society of the end of the last century showed itself as essentially managed and, therefore, everything was conformed to the planned pattern. Every project implicitly pointed to goals and outcomes. Correcting the process was not a criterion of formative criticism, but of the objectification of the results that are quantified from the "products" delivered. In this line of thought, education is also measured based on the results delivered: number of passes and failures per year; quantification of the individual's entry, permanence and success; numerical ranking of mathematical and language ability, by means of scores obtained by international instruments, nationalized for individual evaluation. The shareholder requires a return on their investment.

This same society was read by Bauman as the bearer of the liquidification of the bonds and values of culture, as well as of the identity of being. In his works, the thinker constructs a reflection that evaluates the relations between society and the individual, through the logic of consumption. By presenting the logic of relations in the liquid society, Bauman diagnoses the instruments used by it to define the conditions of life. In his work "Life for Consumption: The Transformation of People into a Commodity" Bauman (2008, p. 20) points out that "the 'subjectivity' of the 'subject', and most of what this subjectivity enables the subject to achieve, is concentrated in an endless effort to become and remain a saleable commodity".

In the expressions recorded in the murals, under the principle of reflection on "what makes you happy?", there are no ideas or concepts considered as foundational of the Western tradition. Terms such as friendship, family, spirituality, culture, knowledge, criticism, freedom, responsibility, etc., are not presented. It is no coincidence that the registered terms belong to people born between 2005 and 2009 and formed in the midst of the constant increase in technological development and the massification of their instruments. To this generation, formative models are proposed for the development of a functional and instrumental intelligence, programmed from the implicit suggestions to the social dynamics, emptying the individual and social sense of intelligence, but also making language shallow in its semantic and syntactic aspects.

Beyond the machine, intelligence is artificialized in the human himself, sometimes through instrumentalized thought, sometimes by strategically assuming suggested actions. There is a generation prone to scientific silence (an articulated effort of critical knowledge), because subjective time is marked by the objectification of time in strategic actions for the result, by which the individuals of the generation in formation are and will be evaluated. The meaning of being is constructed from the imprinted potential and expressed in the socially presented results, which are rewarded or repressed, whether in their time of education or productive life.

Bauman says of the generation that surrenders itself totally to the means of subverting the concreteness of life. According to the thinker,

"Social death" is lurking for the few who have not yet integrated. The new penchant for public confession cannot be explained by "age-specific" factors – not only by them, the impulse that leads to the public display of the "inner self" and the willingness to satisfy this impulse – evidence collected in all sectors of the liquid-modern world of consumers, which was previously invisible – the share of intimacy, the inner life of each person – must now be exposed on the public stage. Those who care for their invisibility tend to be rejected, cast aside, or considered suspects of a crime (Bauman, 2008, p. 21).

However, the concept of happiness is reformulated based on the individual's conformity to the suggested social standard. To this end, Bauman is blunt when he states:

> The most characteristic value of the consumer society, indeed its supreme value, in relation to which all others are urged to justify their merit, is a happy life. The consumer society is perhaps the only one in human history to promise happiness in earthly life, here now and with each successive "now." In short, an instant and perpetual happiness. It is also the only society that avoids justifying and/or legitimizing any kind of unhappiness [...], also in the consumer society, unhappiness is a punishable crime, or at least a sinful deviation that disqualifies its bearer as an authentic member of society (Bauman, 2008, p.61).

Understanding what is implicit in the expressions contained in the mural is essential for a formative critique of the project of society that guides education as a process of adjustment of the individual to the socioeconomic and political-cultural environments for the maintenance of the *status quo*. Reflecting on the expressions recorded by the students can theoretically support didactic decisions and pedagogical projects, as well as training for resistance to the current model of society. In this sense, formative resistance cannot succumb to resilience to the system of an intellectual artificiality. As a process, education needs to be clear about adaptive ideologies, especially those propagated by common sense, as well as by the superficiality of opinionated expression. In both the first and second cases, adaptive ideologies strengthen what is defined as "post-truth" (D'Ancona, 2018).

Turning the analysis to the murals, two expressions should be highlighted: "sleep" and "buy". These records are based on the historical-cultural movement that highlights the characteristic of the present time. For this very reason, what is revealed by the particular or individual demonstrates what is inculcated in the collective. Thinking about these expressions takes us back to Bauman, especially when the thinker highlights the new values assumed by the imaginary and activism of the individual. According to the thinker,

The pursuit of individual pleasures articulated by the commodities offered today . . . provides the only acceptable substitute . . . for the edifying solidarity of co-workers and for the ardent human warmth of caring and being cared for by one's nearest and dearest, both at home and in the neighborhood. [...] The collateral damage abandoned along the trail of consumerism's triumphant

progress spreads across the social spectrum of contemporary "developed" societies. (Bauman, 2008, p. 154-155).

The perception of the formative effects on the reactions recorded in the terms written on the murals reveals a possible gap that is constituted between the educational time and the time of socialized life, surrounded by cultural construction. There is a process of historical dissolution between the integral formation of the human being and specialized education. This effect constitutes what Adorno defined as semi-culture. For the Frankfurter, the historical movement promoted by the "culture industry" (Horkheimer; Adorno, 1985) institutes semi-formation, that is, a formative process emptied of criticism and permeated by the emphasis on rational functionality and the instrumentalization of knowledge aimed at practical application, understood as products of access to the market. According to Adorno (1996, p. 392),

> Cultural formation now becomes a socialized semi-formation, the omnipresence of the alienated spirit, which, according to its genesis and meaning, does not precede cultural formation, but succeeds it. In this way, everything is trapped in the meshes of socialization. Nothing remains untouched in nature, but its rusticity—the old fiction—preserves life and reproduces itself in an amplified way. A symbol of a conscience that has renounced self-determination, it obstinately attaches itself to approved cultural elements. Under its evil they gravitate as something decomposed that is oriented towards barbarism.

The updating of the diagnosis on the category "formation", proposed by Adorno, takes us back to the conditions of what is contemplated in the structure of capitalist social relations, very well described, in our days, by Piketty (2014), Dardot; Laval (2016); Harvey (2018), Mészáros (2021), among others. However, in order to preserve the dialectical critique, present in the Adornian category "formation", it is necessary to understand the logic of the emptying of philosophical criticism, promoted by the education of positive results.

It would be naïve to think of a formative process without it being able to give the individual the security to act productively in the world. However, it is ideological to attribute to education the predominance of the individual's adaptation to the productive model, as a promoter of the forces of production and consumption, devoid of a critical reading of himself, the environment and social relations. The risk is that education for results can lead to individual alienation by human reification to the condition of a measurable commodity by capital.

An educational project for integral formation needs to be constituted beyond the walls of the school, but without being tied to the *lobby* of the productive sectors, contributed by the consumerist perspective. To form, through integral and integrated education, is to promote the broad relationship between human beings (omnilateral), between the individual and the world, strengthening the self-determined consciousness to understand, to understand, to act, to preservation, and to the sense of being epistemic, social, political, ethical, aesthetic, and psychic.

The relationship between education and society, defined by the historical trend of the current political economy, is decisive for the understanding of the individual in formation in Brazilian culture. In this respect, education is longer than class time and cannot only focus on intellect and memory as factors for the outcome. Thoughts, senses, emotions, actions and reactions are constituted beyond the topics covered in fifty or sixty minutes of class.

The intuition manifested in the analysis of the signs printed on the murals has the potential to reveal the increasingly present influence of the socioeconomic model on the students' imagination and reaction. Mészáros (2008, p. 25) had already evidenced this stance when he stated that "few would deny today that the educational processes and the broader social processes of reproduction are intimately linked".

To reposition education, by means of a lucid and expanded process, is to seek in philosophy, sociology, history and languages what constitutes determining factors for social organization. In this case, philosophical criticism is essential to purify what is "naturalized" in the formation of the present generation of young people. The automaticity of analysis, based on results, needs to be confronted by autonomous criticism; That is, a systemic evaluation of the education process not based exclusively on quantitative procedures, but open to qualitative ones, which place the individual as an ethical-political, psychic-epistemic and aesthetic-productive being.

It is through formative criticism that the overcoming of human rational artificiality is strengthened in favor of a self-determined consciousness that does not blindly reproduce what is configured as the historical-cultural determination of the acceptance of the "truth" or truths.

OVERCOMING INDIVIDUAL SELF-PROGRAMMING

The provocative questions from June to September point to facing individual challenges. The synthesis problem: "what are you afraid of?" reveals symbolic and cultural terms and expressions that are present in the students' lives, due to their external connection. We highlight some expressions of the murals that speak of the perspectives of adolescents and young people.

Participation in the June mural approached one hundred records, surpassing that of the following months, which reached an average of approximately seventy expressions. In the June mural and in subsequent ones, several expressions are repeated. There are manifestations that express relaxation, playing with friends and teachers, in addition to instigating them to think about their daily actions. Expressions such as "fear of testing", "fear of teacher", "fear of failure", etc. are used here. On the other hand, expressions such as "fear of being alone", "fear of loneliness", "fear of losing love", "fear of not knowing love", "fear of losing faith", "fear of losing one's mother" and others reveal, ontologically and anthropologically, the dimension of awareness about life in process and about the possible social and material challenges to be faced in decision-making.

From the perspective of subjectivity, the mural reflects "structure" and "verbal intelligence" (Piaget, 1975, p. 13)[6] of the students, through which they apprehend, reflect and externalize the concerns of the environment. It is possible to perceive the variations in the registers that mark the passage from simple to more complex expressions. The conceivable causes of this alternation may be based on the implicit meaning of the records.

During the course of the project, from July to September, some students had already searched for the reason for the mural and the provocations. Probably because of this, the expressions proved to be more complex and consistent in the face of provocations. Thus, it is understood that when the individual understands a purpose, becoming aware of it, his response tends to be deeper, even if the consciousness turns to the evaluative weight implicit in the individual expression.

On the other hand, the objectivity of the problem posed in the mural is to "*pro-voce*" (to call out of oneself - to challenge) subjectivity, whether in perception, reflection or expression. Provocation allows the comprehension of the real and symbolic values and elements that are placed in the culture, which are assimilated and converted into action/reflection (and/or reflection/action) from the cognitive construction of the student, with the meaning required in the social-political environment in which he or she is inserted. Therefore, the understanding of what is done, why it is done and how it is done reveals the importance of a curriculum focused on the formation of critical awareness.

Thus, the analysis of the formative foundation of the participants, expressed in their records, seems to point to different conceptual and operational approaches. It is noted that the problem situation posed by facing the challenges reveals the "fear" (or fears), in many aspects, which may be configured for some students only in terminological expressions used and, for others, it may be loaded with experience or sociocultural apprehensions. .

The correlation between term (word) as a cultural expression and as knowledge or experience promotes the confrontation with a theme that involves both philosophy and pedagogy: the relationship between "subject" and "object". Such a relationship is constructed in Western culture, especially from the epistemological and axiological perspective. The knowable and the knowable are articulated by the conditions of knowing and acting, which are based on biological, psychic-emotional and sociocultural factors that direct the dynamics of human life towards a sense of being.

The students leave, in their records, something consigned by the culture to which they belong, but without reducing themselves to that. Read from the perspective of Vygotsky (2001, p. 169.)

[6] In line with Kesselring (2008, p. 78), we present the concept of "structure" in Piaget as "[...] a system with totalizing laws or properties, [...] a system of transformations which, as a system, has its own laws and which, precisely because of its transformations, is preserved or enriched [...]. A framework encompasses the three aspects of wholeness, transformation, and self-regulation."

The process of concept formation is irreducible to associations, to thought, to representation, to judgment, to determining tendencies, although all these functions are obligatory participants in the complex synthesis which, in reality, is the process of concept formation. As the research shows, the central issue of this process is the functional use of the sign or the word as a means through which the adolescent subordinates his own psychological operations to his power, through which he dominates the flow of his own psychological processes and directs their activity in order to solve the problems he faces.

Nevertheless, it is necessary to highlight that the proposition assumed by Vygotsky is based on a different sociocultural analysis of Brazilian culture, represented in the murals. However, it should also be noted that the social model that involves the participatory agents of the murals is a result of the European bourgeois cultural construction, which is historically responsible for the influence on the social, religious and economic structure of colonized countries, but also North American, which promotes pragmatism and utilitarianism. For this reason, it is possible to understand in the murals what Walter Benjamin defined as "culture of childhood", but which is loaded with systemic determinations. According to Sanches (2017, p. 29),

> The ideal of the adjustment of the working class to the *status quo* is taught already in childhood, so that the child lives it as much as possible, without seeking to deviate from it, towards the adapted and upright adult, the bourgeois citizen. Such interest in modeling the child is something that carries with it not only the idea of class, although it intensely composes the repertoire of teachings, this eagerness also resides in the fact that the adult is the end of the child as a natural process of its development. Therefore, it is up to the moderns to think of ways of educating it, molding it for this purpose.

It is extremely important to recompose Benjamin's thought, dialoguing it with the construction of the individual and social imaginary of the students who acted in the expressions of the murals, whether to understand the process of infantilization of the adult or the maturation of the infant, including through their expressions.

Fleeing from the "modeling of people" to the resumption of the possibility of the "*production of a true consciousness*" (Adorno, 2006, p. 14. Emphasis added), by educating students aged 14 to 18 (on average), we are faced with the educational paradox. This is the field of implicit dispute between the curriculum made official in the Pedagogical Projects of Courses (PPC's) in the face of the influences of the educational guidelines and orientations elaborated by international organizations for Latin America and the Caribbean, in addition to those specific to business corporations that make education the production of their wealth.

INTEGRAL EDUCATION AS A NEOLIBERAL PEDAGOGICAL MYTH

Education seems to compose a conceptual sense "naturalized" in Brazilian culture, to the point of becoming the object of debate by people who do not have training or research in the area. In fact, several positions expressed from or about education reveal the naïve proposition of common sense. Undoubtedly, education is a terrain of disputes, not only didactic-pedagogical, but also economic, political and religious. The construction of an educational policy already brings with it the elements defined by the group (or groups) that represent economic power.

As a popular subject, the term has formed the basis of the discourse of the extreme right in Brazil in the last decade, supporting a conservative and even reactionary perspective. On the other hand, it composed the terrain on which capitalism took root to germinate a school model that has the mission of adapting the individual to productive demands, instrumentalizing perception (Ger, 2012) (aesthetics of the simulacrum),[7] reflection (positive epistemology), [8]action for creativity (in reference to the new) and creative/entrepreneurial action. focused on the production of capital.

When the formative process is subsidized by the neoliberal project, the prerogative of an integral education (epistemic, ethical, political, psychic, aesthetic, etc.) becomes a fetish in the discourse of educational policies and is mythologized in the formative programs in which the "new formation", or "new pedagogies" for the present time are transformed into a myth of itself. The human in the process of formation tends to be converted into a model piece of the pattern that inspires and regulates reality.

The organization of "knowledge" is technically assumed to correspond or respond to the dictates of international organizations, which numerically set the standard of quality. The foundations and training purposes are realigned in view of the adjustment required primarily for production. Education is transfigured into adjustment, adaptation and instrumentalization of knowledge. It is evident that these factors are necessary in contemporary times. However, they can represent neither the foundation nor the purpose of an education that purports to be emancipatory.

Faced with this, philosophy presents us with a necessary reflection: what is the intentionality that is hidden in the proposition of the formative curriculum?

At the outset, it should be noted that the primacy of the colonizing curriculum (Machado; Alcântara, 2020) will always impose itself on the struggles and achievements of education carried out by third world countries. The ideology of civilizing cultural superiority (Dussel, 1993), also expressed in European and North American scientific regulation, becomes an authority in the process of formative regulation of public policies and educational plans in those countries stigmatized as underdeveloped or developing.

[7] Ger (2012) characterizes the trend of simulacrum aesthetics.
[8] Silvino (2007) helps to understand this tendency.

However, what is the link between this conjuncture and the expressions recorded on the murals?

Students are immersed in the culture that forms them. However, such immersion is naturalized as a historical-social process. Being immersed in the constituted historical-social movement does not necessarily mean being conscious, nor does it mean being a "protagonist" of it. Operational and instrumental thinking is stimulated, from childhood, to serve the search for expected and determined results, socially and economically, as primacy. On the other hand, adjustment and rational functionality are integrated into the productive and social pattern of living. Even the notion of critical thinking is clothed with an operationality that poses itself as analytical, not to adjustment, but to divergence from the assumed formative pattern. The rationality that claims to be enlightened and critical is clothed in the irrationality that legitimizes the reification of the human, making it an object of the productive system. For individual survival, the daily struggle of all against all is established, comprised in the search for employment, in the maintenance of the standard of living, in the surpassing of the other for a higher wage, in short, by an unbridled competition.

The search for the supplanting of the irrationality that is constituted from the neoliberal model of education is mythologized in the proposition of an integral education, but one that responds instrumentally to the capitalist system. In itself, this stance is contradictory. This is because, from childhood, the individual is involved in an education that rewards some (approval, for the best performances) and punishes others (imprisons, in time, the underperformers). For this reason, it is necessary to rescue a broad formative process, which allows the formulation of critical thinking about the educational programs that are born under the baton of the maestro of the market: neoliberalism.

Now, if the immanent critique of education is a presupposition for an emergence of the critique of the educational process, then educating for criticality is to elevate the formative proposal to overcome the automaticity that instructs educational institutions to act based on the measurement of the success acquired in the evaluative indexes. Yes! These data are important as a means, but the goal is integral human formation, because there is no humanity in the coldness of results that only take into account goals, excluding oneself from ontological, anthropological and ecological responsibility.

The neoliberal myth of an integral education is constituted from positivist, utilitarian and pragmatist reasoning, which underlie different curricular compositions, placed at the service of the capitalist system, whose focus is to minimize time in order to maximize results. In this sense, one of the postures of philosophy is to bring to rationality what is being established, in social relations, as a habit. To question the obvious is to overcome the irrationality present in the operational. Doing by thinking and thinking by doing is the implicit activity of *libertarian* praxis.

In this sense, the mural project, carried out at the Goioerê Advanced Campus, of the Federal Institute of Paraná, which sought to capture and expose the thoughts of students of technical courses integrated into High School, can be understood as a means of revealing the myth of integral education that is also present in the Federal Network of Professional, Scientific and Technological Education.

With the Network, the Federal Institutes are born from the perspective of rebuilding a national project. However, as institutions of the State, the Network and the Institutes are being incorporated into the dynamics of capital and, based on historical paths (only 15 years), they are remodeled and weakened by the neoliberal spirit that exerted political and financial influence on top management, as well as on the composition of the curriculum adaptable to the scenario, and on the petty-bourgeois mentality (Althusser, 1980) of many civil servants who did not incorporate the institutional philosophy.

Criticism is salutary, because it exposes the educational work also as instrumental and functional. Educational comprehension is decisive for the restoration of the intellectuality that makes up the IFPR, beyond the mere sophistic rhetoric of persuasion. Education takes place in the midst of divergence, diversity, integrated in the dialogical and dialectical process for the deepening of knowledge. However, it is essentially focused on humanity, materialized in the students.

FINAL THOUGHTS

Education, understood as a process, brings together different people, with their different cultures, manifested in different age groups. In Brazil, school education is defined based on the levels and stages of teaching. At the first school level, there is basic education, consisting of the stages of early childhood education (0 to 6 years old), elementary school (7 to 14 years old) and high school (15 to 17 years old). At the second level, there is higher education, which includes sequential, undergraduate, graduate and extension courses.

The present essay contemplated the time frame from 15 to 18 years old, which corresponds to the stage of Integrated High School, offered on the Campus. In this age group, the seductive influences of social networks, the intensification of taste and openness to consumption are present, in addition to all the training framework required by society. It is noteworthy that the time of the school – the 5 hours dedicated to classes and other hours dedicated to projects, monitoring, attendance – is confronted with the time of media pleasure, of the playful taste for electronic games, of social networks and of other cultural manifestations that are typical of contemporaneity.

In this process, the fixation on the virtual accompanies the student, including in the classroom, through the irrational use of smartphones. The dependence on media tools in the classroom and in living spaces is notorious. You can hardly find a group of friends talking. For the most part, even

occupying the sofas, sitting next to each other, the interaction is not between humans. But, between man and media. In this process of formation, discoveries, confrontations, frustrations, challenges and fears are natural. However, they cannot be naturalized or put at the service of the capitalist strategy of the search for "efficiency" and "effectiveness", which submits the human being to the mechanization and commodification of his existence.

By being proposed, also by the librarian of the Goioerê Advanced Campus, the project served to stimulate personal records based on problems implicit in the dynamics of each demonstrator's life. However, the dynamics of *praxis*, constituted by observation, comprehension, reflection, action and evaluation, was also analyzed as a challenge for a philosophical understanding of the formative process of the educational stage of High School.

The observations on the murals, as well as the critical reflection on the thought formulated through them, open up as a real possibility to rethink the challenges implicit in this formative stage. This is what the essay sought to do based on the findings made by critical theory. In the diagnosis of this process, it became possible to perceive the elements that corroborate the bourgeois spirit and the culture of consumption.

Such elements may reveal that the notion of integral education that makes up the neoliberal discourse of education is mythologized in an idea of autonomy, directed by the regulating force of productive efficiency. In it, the classification of the best, the averages and the lowest is reinforced in the numerical indices of quantification by the score from zero to 100, or in the concepts that allegedly qualify (but classify) insufficient, sufficient, good and excellent.

Being aware of the regulatory forces of educational policies, as well as of the sociocultural and political-economic values that are systematized in the construction of the curriculum, is shown to be a critical potential to expose the ideological biases of neoliberalism, disguised in training projects regulating labor that have strengthened the "privilege of servitude" (Antunes, 2020).

The space and time of the school are not exempt from external interventions. Education, culture and society are integrated and interrelated with the dynamics of the present time. In view of this, the analysis of the project revealed that the school organization and the curriculum constitute terrains of political-economic disputes. Therefore, they are assumed as a means of sociocultural adjustment to the standards determined by the control mechanisms. On the other hand, it evidenced the implicit correlation between education and rational instrumentalization in favor of a productive dynamic, inculturated in the expressions collected.

The critique of the school model is decisive for the confrontation of education as a process of epistemic, political, ethical and aesthetic formation, understood as a prerogative inculturated in the student. The educational formality, which regulates the construction of the academic calendar, which governs the beginning and end of the time corresponding weekly and bimonthly to the curricular

components, which manages the effectiveness of learning, rewarding those who conquer their spaces in higher education courses, has been governed by a mentality that is also instrumentalized.

On the other hand, result indicators have instrumentalized managers to become increasingly regulators of institutional marketing. They are forced, annually, by the administrative criteria of effectiveness (ability to enroll students) and efficiency (ability to retain students), to run the institution by the effective standard of "management reports". The formative critique is emptied and assumes the dynamics of adjustment: this is one of the implicit criteria for remaining in positions of trust or not jeopardizing the possible re-election to the efficient leadership.

Education can be "trans-formed" by what would be a fundamentally educational positioning, if there were really a confrontation with the project that seeks only to adjust and instrumentalize individuals to the processes. That is why the question arises about the purpose and foundation of the education that takes place on the IFPR campuses. It is also necessary to raise the issue to the highest level, in the sense that if there is really a training project under construction at IFPR that contemplates the real integral and integrated training of our students, whether they are those of the Initial and Continuing Education of workers, those of the High School Integrated to technical training, as well as those in higher education.

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Significant use of technologies in digital education

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ABSTRACT

The expression digital technological literacy has been increasingly used in the educational environment to characterize a learning prototype specifically of writing that involves signs, gestures and procedures necessary for the individual to be able to read and write on the computer, notebook and/or other digital devices. According to Educação (2022), the meaning of its noun in the Portuguese language is: "training or training of new generations according to the cultural ideals of each people". However, it is necessary that within education it is of the new generations as well as the oldest, when having contact with the internet, digital education both for parental guidance and for the physical experience of children in the world/family that they are inserted in at birth.

Are we able to think of literacy done with digital tools? Bringing it to the context of literacy and literacy, the various digital equipment bring new ways of thinking in relation to the production, communication, propagation and dissemination of the writings of those involved that are inserted in the context of digital education that is being presented at the time of transmission of this new knowledge.

This indispensability is so that we can bring to everyone the continuous loving orientation for interaction with respect, ethics and integrity also to the digital world, so that we will have posts, videos, stories, vlogs, blogs, etc. that take into account the kindness in treating as it is done "live and in color" and we have delicacy in conducting conversations to generate records and meaningful memories for the normal days as well as for the special ones without the face of the "naked truth" and raw" or "more sincere opinion" which in fact, often comes with: lack of tolerance, absence of empathy/respect and lapse of kindness when treating others.

In addition to the lack of patience and hate speech that occurs in abundance on the internet, it is necessary to include in those who circulate in this digital environment the awareness of the dangers that travel in it, that is, in this environment not everything is roses and just as we have traffic education about circulation on the streets, it is also necessary that the cognitive process for digital education is done in the various nuclei that the person is part of and brings with him in the their experience, such as in the family, at school, in the community, at university or at work.

Therefore, it is important to teach digital technologies in the literacy of children, adolescents and young people so that we have future adults who are digitally literate, not just users of electronic devices. The need

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for digital ethics must be imbued with them, in addition to the playful possibility that will be included in the literacy learning environment, in addition to the virtual and sensory experiences that technologies can bring. So the use of digital technologies in literacy brings with it the possibility of mixing: calculus, spelling, arts, environment, geography, history, technology, body and many others; each other so that the gain is in all fields: cognitive, socio-emotional, bodily and transcendental; so that knowledge and skills involve all the intelligences of the human being, not only those most required by society such as Portuguese and mathematics.

Keywords: Digital education, Technology, Technological literacy.

INTRODUCTION

In view of digital literacy, it emerges as a proposal for the interweaving of the use of accessories of registers that are being used in written initiation and the presentation of reproduction systems, whether they are: - letters, graphic sketches, icon schemes, representation of the most varied colors, sounds, expressions in still and/or moving images. The simple gesture of speaking or writing by means of some technological devices brings a relevant meaning of the functioning on the writing of those involved.

However, in order for this exchange of knowledge to take place, it is necessary for the child to have contact with the most different techniques so that the intertwining between the machine and the new knowledge that is being proposed in the classroom or outside of it for children in the literacy and literacy phase emerges: learning to deal with the use of new technologies develops cognitive operations and this allows the memorization and internalization of technologies to A new knowledge that is presented to you and causes effects not only on the writings of cell phone screens or other devices, in sequence, sharpens the new knowledge about the more specific functioning of the new instrument used for writing. Thus, digital literacy is an important component of digital literacy since literacy, and both need to be inserted and taught in school since recent literacy is restless because of the digital environment and its new technological configuration that is allied to the school as a contribution to teaching today.

DIGITAL TECHNOLOGICAL LITERACY

The use of technologies can help the school in the literacy process. Since it opens the doors to a range of activities that are available and the child evolves promoting improvement together with teaching from within the classroom. In addition, such literacy is not only linked to the school environment, it is essential for the elderly who also have difficulty in handling electronic devices in general and depend on grandchildren, children, siblings, that is, if they cannot manage their emotions of shame, fear, anxiety and in this way they will hardly be able to overcome the barrier of using the device.

These devices make it possible to mix: calculus, writing, arts, environment, geography, history, technology, touch and many others; each other for the teaching of a given subject, so that the gain is in all fields: cognitive, socio-emotional, bodily and transcendental; so that knowledge and skills involve all the intelligences of the human being, not only those most required for society such as Portuguese and mathematics.

It is certainly because the devices have many attractions, animations and propose dialogues and challenges for children and educators, as well as enabling a dynamic for the class. In addition, there is a huge library of materials that can be used in the literacy process in a playful way, both in

calculus or writing, arts, environment, geography, history, technology, body and many others. They enable multiple learning: cognitive, emotional and psychomotor; It also stimulates neuroplasticity and, depending on the new experiences of the student, generates synaptogenesis.

DIGITAL ETHICS FOR CHILDREN AND ADOLESCENTS

According to Bandura *apud* Borges-Andrade, there are four steps to an archetype in the modeling process in his theory:

- Attention: the attention of the modeler or learner must be focused on the model, otherwise the learning will be interrupted.
- Memory: the individual must retain what he has observed in order to later execute it.
- Reproduction: the behavior is initiated and the person must be able to imitate it, not necessarily the same, but must perform it.
- Motivation: in this part it is necessary to know what led the person to perform the behavior. What do you want to achieve with imitation? You might want to get to the same state as your model. (1981)

In the family nucleus, the patterns as well as models are constantly molded and passed through the aforementioned archetype, precisely because learning is done through the emotional nature of the cognitive stimulating connection between the child and parents or guardians or grandparents, regardless of the pernicious or benign paradigm. For the other environments, which will be socially part of the individual's coexistence and will make a difference in the maturation of the cognitive psychological, the process of assimilation and accommodation must also include the person whom the minor identifies with "deference, respect, charm, consideration".

However, from the first steps of life, it is necessary to start introducing ethics for children and young people, because "relativity applies to physics, not to ethics" (Albert Einstein apud LISBOA et.al, 2021) and when this human being physically transposes to the family group, this competence will be essential, as well as this issue will be applied to the digital world.

In other words, when being introduced to the use of electronic devices, it is essential to teach where data flows from and that it can be tracked. That is, a cell phone that performed a certain activity can, through forensic extraction, verify the evidence of the activities performed on it, in this digital literacy it is also essential to teach that just like the street where cars travel, the internet is a means of communication in which it contains dangers, in addition to that for certain uses in this means of communication it is essential to train and self-sufficiency so that one does not fall into deception or in other cases, Where there is a minor involved, supervision is required.

INTERNET: MEANS OF COMMUNICATION VS. DIGITAL EVIDENCE... HOW TO RAISE AWARENESS?!

According to Corga (1998, p.70), social psychology consists of:

> [...] a set of foundations, convictions and expressions that make up and dynamize a culture. This set is recognized by a community, just like its marks, as the characteristics belonging to this group, and that, therefore, differentiates it from the others.

In other words, the societal teacher teaches through the "colorful" campaigns of the months so that the individual's cognitive process the information through the emotional and arouse his attention. However, when one is in active coexistence within a group, it is likely that the person adjusts or excludes himself from that group, so it is necessary that the "organizations", "schools", "families" educate their parts about values, decisions, what is allowed, what is not allowed regarding human behavior within the construction of citizenship and the connotation of positive and negative value.

The primary awareness mentioned above will make a difference when entering the digital environment, because the operative group of a given structure already has in a centered way value, notion of structure, power, legislation, how society is constituted. According to the Presidency of the Republic (2015), cyberbullying is intimidation using the internet with the purpose of harassing, violating, embarrassing the person who is the victim of bullying, in addition to these activities, it is also possible digitally to curtail the action of an individual in this means of communication or even impersonate someone else.

ISO 27037, which provides for forensic work, standardization of the treatment of digital evidence for investigation and preservation of the integrity of digital evidence with its methodology within the judicial process to obtain reasonableness, evidentiary effectiveness and relevance. Therefore, in the use of this standard, it is necessary to follow the procedures of "identification, collection, acquisition and preservation of digital evidence" so that it can have probative value and assist the organization or the judiciary in its procedures and interventions.

The following are considered devices that can be worked on by digital forensics:

- Digital storage media used in computers, such as HDD, CD/DVD, flash drive
- Smartphones, tablets, personal digital assistants (PDA), personal electronic devices (PED), memory cards;
- Mobile navigation system (GPS);
- Digital video and photography cameras (including CCTV);
- Desktop, notebook;
- Internet of Things (IoT): A network of connected devices and technology that facilitates communication between devices and the cloud. Example: home security systems, refrigerators connected to the internet, electronic locks, air conditioning connected to an

Alexa or various other devices connected to it, connected car such as voice assistance, automatic braking, among others.

In view of the above, it is of paramount importance to make every individual who uses an electronic device aware that their activity on this device is recorded and can be recovered through an ethical, non-judgmental, non-biased and fair process. According to ECA in its articles 100 and 104:

> Art. 100. In the implementation of the measures, pedagogical needs will be taken into account, giving preference to those aimed at strengthening family and community bonds. [...]
> IX - parental responsibility: the intervention must be carried out in such a way that the parents assume their duties towards the child and adolescent.
> [..]
> Art. 104. Minors under eighteen years of age, subject to the measures provided for in this Law, are not criminally chargeable.
> (ECA, 1990)

Minors under 18 years of age are liable to be judged for their acts and actions made on the "internet" as well as adults, however, according to the ECA, from the evaluation of the judiciary, initially who will answer will be their "father" or "mother" or "grandmother" or "guardian". A situation that the minor is probably not aware of is that, depending on the deliberations in the sentence, even the removal of guardianship may be included for those responsible judged in the name of their action, according to article 129 of the ECA:

> Art. 129. The following measures apply to parents or guardians:
> I - referral to an official or community family protection program;
> I - referral to official or community services and programs for the protection, support and promotion of the family; (Text given by Law No. 13,257, of 2016)
> II - inclusion in an official or community program of help, guidance and treatment for alcoholics and drug addicts;
> III - referral to psychological or psychiatric treatment;
> IV - referral to courses or orientation programs;
> V - obligation to enroll the child or pupil and monitor his/her attendance and school performance;
> VI - obligation to refer the child or adolescent to specialized treatment;
> VII - warning;
> VIII - loss of custody;
> IX - dismissal of the guardianship;
> X - suspension or dismissal of paternal power, family power. (Expression replaced by Law No. 12,010 of 2009) Term
> Sole paragraph. In the application of the measures provided for in items IX and X of this article, the provisions of art. 23 and 24. (ECA, 1990)

Thus, unless there is a pathological dysfunction among family relationships, but it must be considered before committing a crime for "only" exposing your "toxic" opinion on the internet or on a social network application, which your guardian will respond to on your behalf. This is the basic type of awareness for all underage users who use electronic devices connected to the internet and for those who use a disconnected device, it is important to know the other crimes committed by storing certain files in it, such as: an adult who "safeguards" "pornographic" files of children and adolescents

on a certain electronic device, Article 241-B of the ECA may include: "*acquiring, possessing or storing, by any means, a photograph, video or other form of record that contains an explicit or pornographic sex scene involving a child or adolescent*".

COGNITIVE PROCESS FOR DIGITAL EDUCATION

Some research undertaken by Emília Ferreiro shows that the computer does not interfere in the concept of representation of alphabetic writing. However, its use influences the learner in several issues: in the notion of spacing and in decisions about the arrangement of the text on the page; experimenting with shapes, colors, and size of letters; in the perception of marks and automatic spelling corrections.

However, it is necessary to be aware that some devices have physical and system sensors, for example, biometric sensors are physical sensors, with installed hardware, while infrared sensors that map the face in three dimensions using points that are interpreted by the device's software. In other words, digital technologies can help from psychomotricity, musicality or even exact, biological or human subjects in a playful way through the multiple sensors installed in the devices, whether via hardware or software.

In this way, ICTs can help the cognitive process to support neuroplasticity and reorganize the development of learning in an expressive way, making new connections from new experiences and encouraged by the educator, supporting and reinforcing the necessary skills that the student demands to develop, which requires that it be a permanent memory within their learning process. Not just a space within short-term memory that is soon "lost".

Digital technological literacy in the classroom is a crucial element in preparing students for the contemporary world, where digital skills are indispensable. Let's explore this approach in detail:

DIGITAL TECHNOLOGICAL LITERACY IN THE CLASSROOM

Digital technological literacy in the classroom concerns the insertion of digital tools through technological skills within the teaching and learning process inserted in the midst of the student public and a priori, aims to enable students to correctly and pedagogically use these digital technologies effectively and critically, preparing them for academic life. professional development aimed at your personal and concrete growth as a person.

Due to this technological and evolutionary demand that has been growing every day with a range of cerelicity among students and this growth, it is almost impossible to keep up, because it is important to recognize that it is necessary to enable new learning and/or arouse the interest of the student for the use and construction of new knowledge about the use of these Digital Information and Communication Technologies (TDICs).

According to Base (2018),

> "Understand, use and create digital information and communication technologies in a critical, meaningful, reflective and ethical way in the various social practices (including school ones) to communicate, access and disseminate information, produce knowledge, solve problems and exercise protagonism and authorship in personal and collective life." (BNCC, 2018)

IMPORTANCE IN EDUCATION

Digital skills are essential for most careers. Teaching these skills at an early age prepares students for the job market. Digital technologies allow for more personalized teaching approaches, adapting to the individual needs of students. Digital tools can make lessons more interactive and engaging, increasing student interest and motivation.

COMPONENTS OF TECHNOLOGICAL LITERACY IN THE CLASSROOM

Teach students how to correctly use hardware (computers, tablets, smartboards) and software (word processors, spreadsheets, presentations) in a pedagogical format, enabling them to research efficiently and leading them to evaluate the credibility of the online sources in which they are researching. Properly instruct about safe online practices of good research, data privacy and ethics in the use of the technologies in which they are making use. Encourage them to create their own digital content, such as blogs, vlogs, videos and multimedia presentations, making use of digital platforms that promote collaborative, qualitative work and good communication between students.

IMPLEMENTATION METHODS

Use of educational platforms, such as tools such as Google Classroom, Microsoft Teams and Moodle and others facilitate the management of classes and interaction between students and teachers. Classes in an interactive way with the use of educational apps and games to make learning more dynamic, didactic and playful. Practical projects where students use digital technologies to solve real problems in an interdisciplinary way, both in the construction of projects and in their realization. And finally, the training of educators in the effective use of digital technologies (ICTs), ensuring that they feel comfortable and have the skills to teach these new technologies in the classroom.

CHALLENGES AND SOLUTIONS

The lack of access to devices and the internet in many schools still remains one of the biggest challenges in much of our country. Even with some government solutions or programs and partnerships with companies to provide equipment and connectivity, there are still great difficulties to work with ICTs in most schools, especially in public schools. Not only due to the lack of

technological equipment, but also due to the lack of training of many education professionals, many teachers may not feel prepared to use digital technologies and/or do not have training to use them in their classes. It is necessary to take a close look at this demand, which grows more and more every day according to the use of digital tools, and offering continuous training and technical support can help overcome this barrier and open up a range of opportunities not only for students but also for education professionals.

Digital technological literacy in the classroom is critical to preparing students for the challenges in their lives. Implementing these practices not only requires investments in infrastructure, teacher training, and the development of curricula adapted to new technological realities, it's more than that! It is to contribute to the formation of ethical citizens who will have a posture with an integrated and inclusive approach, where it will be possible to provide students with the necessary tools to become competent and critical citizens in the face of this digital world that often lives in the face of inauthenticity.

FINAL THOUGHTS

The significant use of technologies in digital education has the attribute of transforming the way we learn and teach, making education more accessible, personalized, and efficient. However, to achieve these benefits, it is essential that the implementation of these technologies is carefully planned and prepared by a strong foundation and the appropriate qualification of educators.

Therefore, for the use of technologies in digital education to be truly transformative, contemporary and revolutionary, a joint effort is needed to overcome challenges and maximize the benefits it brings to the entire evolutionary context of those involved. Digital education has great potential to create a more inclusive, engaging, and effective learning environment, but this will only be possible with a strategic approach and an ongoing commitment to teacher training and improving technological infrastructure for the benefit of students.

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A mosaic of ideas emerging from digital technologies in contemporary education

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ABSTRACT

The imperative of physical and social distancing, caused by the Covid-19 pandemic, has further highlighted the relevance of digital technologies in society. In this sense, this article aims to present a mosaic of ideas emerging from digital technologies for education in contemporary times, aiming to demonstrate the various possibilities of DICT for teaching, contributing to the promotion of a hybrid education. It is concluded that the DICT present numerous possibilities for carrying out hybrid teaching practices, allowing the DIY of audio, from the creation, mixing and remixing of the file; DIY in image and video, enables mass communication, through messenger applications, videoconferencing, through real-time communication, with several people at the same time, collaborative learning/online teaching, considering that the learning subjects already use DICT in their daily lives.

Keywords: Cyberculture, Digital culture, Digital interfaces, Digital Technologies.

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INTRODUCTION

Given the potential of emerging digital technologies in the educational field, there is a need for educational institutions to resignify their pedagogical practices, bringing classes inspired by the principles of cyberculture, as proposed by Santos (2019), enabling young people to co-authorship in a network. As highlighted by Sales and Albuquerque (2020), learners use digital technologies on a daily basis to mediate their social relationships, as well as to construct knowledge, requiring educational institutions to promote pedagogical practices that allow the use of digital technologies in the construction of knowledge.

For Kenski (2009), digital technologies refer to electronic equipment that connects to the internet and enables network interaction and communication, encompassing computers, cell phones, *tablets* and many other devices. The author's definition of digital technologies is clear and comprehensive. For her, these technologies encompass a variety of electronic equipment. This broad understanding of digital technologies is critical to understanding their impact and potential in the various spheres of our lives, including education, work, and society as a whole.

Similarly, Valente (2013) points out that in addition to TDICs referring to electronic equipment that connects to the internet, they expand the possibilities of communicability of their users. The author's contribution adds an essential perspective on digital technologies. In addition to referring to electronic equipment connected to the internet, these technologies expand the possibilities of communication between users. This implies not only the exchange of information, but also the creation of meaningful connections and more dynamic interactions. This communicative dimension of TDICs is fundamental to understanding their impact on social relations, collaboration, and collective construction of knowledge.

In this sense, digital technologies present a mosaic of possibilities for subjects, being widely used, according to Sales and Albuquerque (2020), by learning subjects to communicate, interact in a network, create and share content. However, originally, most digital technologies are not developed for pedagogical purposes, requiring teachers to study their critical-reflective insertion in pedagogical planning, aiming at adapting and creating motivating and creative learning environments for students.

From this perspective, the context of the Covid-19 pandemic has made it possible for educational institutions to experiment, albeit forcefully, with the pedagogical use of digital technologies to mediate teaching. According to Santos, Santo and Souza (2022), the mandatory social physical distancing generated a process of compulsory migration from face-to-face to remote teaching, requiring teachers to use digital technologies as mediators in this process to ensure the continuity of the students' training path.

Focusing on digital technologies as facilitators of the educational process, the scope of this study aims to present a mosaic of ideas about how digital technologies enable teachers to develop classes inspired by the principles of digital culture, allowing students to build knowledge using the potential of digital technologies. For Nonato (2020, p. 537), talking about digital culture "[...] implies an understanding of the role of digital technologies in human action [...]" in contemporary society, "without thereby implying an alleged rupture of the purity of a fully human culture now invaded by technologies" (p. 537). Emphasizing that "every human culture contains and presupposes the technique and technology that man produces as a condition and unfolding of his existence in the world" (p. 537).

Thus, we understand that digital culture refers to the set of social relations that human beings establish in a network, mediated by digital interfaces connected to the world wide web. That is, from the use of digital interfaces that help in urban mobility to facilitate movement through cities; through *delivery* apps, delivering the subjects' orders at home; through the use of social networks for sharing, interaction and entertainment. In short, in the various ways that subjects use digital devices connected to the internet to relate to the world and build their knowledge autonomously in their daily lives.

Thus, this study aims to present a mosaic of emerging ideas of digital technologies for education in contemporary times, aiming to demonstrate the numerous possibilities of digital technologies for teaching, contributing to the promotion of a hybrid education. The chapter is structured in three moments, the first seeks to list some notes about the learning subjects in the context of digital culture, pointing out that young people use technologies on a daily basis to build their social relationships and produce knowledge.

The second discusses the emerging ideas of digital technologies, presenting a framework with some possibilities provided by digital technologies in educational environments, signaling the need to develop effective hybrid teaching practices, ending with some final considerations.

LEARNERS IN THE CONTEXT OF DIGITAL CULTURE: SOME NOTES

The advent of the internet and the exponential development of Digital Technologies have significantly changed people's perception of the world, being incisively present in the daily lives of individuals. From this perspective, the pandemic context resulting from the Covid-19 pandemic threw teachers and students into virtual learning environments, according to Santo, Lima and Oliveira (2021), forcing school institutions to use digital technologies to carry out classes and continue the teaching process. This shift to virtual environments allowed teachers to develop or improve various digital skills, favoring the development of dynamic classes, mediated by digital technologies in the post-pandemic period.

Digital technologies connected to the internet allow for an infinity of possibilities, however, they import everyday social problems into the network, such as racism, xenophobia, false information, etc. This reinforces the need to promote anti-racist education, based on values and respect for diversity. For Palfrey and Gasser (2011), the internet is characterized as a market, bringing the logic of the fallacious meritocracy, providing little in terms of *online equality*. This context requires the promotion of a counter-hegemonic education, which enables the student to actively participate in the network, to raise the critical sense, detaching from the mere reproduction of knowledge.

Reducing the digital divide requires the performance of a cybersituated teacher (Santos, 2019), that is, it asks the teacher to make pedagogical use of digital interfaces in their praxis, forming critical and reflective students (Freire, 2001). The pandemic context revealed digitally excluded teachers and students who had difficulties to keep up with the remote teaching process, bringing the need for a debate on the digital inclusion of teachers and students. However, this context also revealed teachers who engaged in the process and developed digital skills, which allowed them to act positively in the post-pandemic context. Nolasco-Silva and Lo Bianco (2022) state that the implementation of remote teaching revealed cyber-situated teachers, creating classes inspired by the principles of cyberculture.

According to Santos (2019), the construction of knowledge based on the principles of cyberculture means transgressing the mere reproduction of knowledge, placing the subjects as learners (Sales; Albuquerque, 2020) in the position of content creator and co-creator. For Santos (2019), the logic of *uploading and downloading* content, without interaction between the author and user, was part of the communication process characteristic of an early period of digital culture and counterproductive in contemporary times.

Thus, Santos (2019) points out that the current context brings as a principle the interactivity in a network, enabling authorship, co-authorship, the sharing of knowledge in cyberspace between subjects. Cyberspace is defined by Santos (2019, p. 30) as "a plural set of spaces mediated by digital interfaces, which simulate contexts of the physical world of cities, their institutions, individual and collective practices, already experienced by human beings throughout their history". Therefore, the author's definition of cyberspace is enlightening, because from this understanding, the ability of digital technologies to enable virtual environments that replicate and expand human experiences, allowing remote interactions and connections, is highlighted. Cyberspace thus becomes a hybrid space where social, cultural and communicative activities take place, providing new forms of interaction and engagement.

The effective performance of the school in this context demands from teachers the promotion of an education that teaches the student to think and reflect critically (Freire, 2001), going beyond the

mere reproduction of knowledge. The school's challenge in this context is to form an integral subject, with empathy, so that they can act in cyberspace without losing sight of ethical precepts, respect for diversity and critical thinking. The role of the school in the context of digital culture goes beyond the instrumentalization of young people to know the procedures for using a given digital interface. Far from it, its objective is the emancipatory and critical formation of this subject to act in the internet space as a citizen (Freire, 2001).

From this perspective, the basic principle of an integral education for the effective performance of the student in cyberspace demands transdisciplinary pedagogical proposals, based on values, based on citizenship and the understanding of the human being as a subject of rights and diversity. Therefore, it is necessary to inhabit cyberspace with people interested in creating bridges and not walls, because bridges connect, allow the sharing of knowledge, interaction between authors, enable co-authorship, the construction of knowledge in a collaborative way, while walls separate.

In this way, discussing the emergencies of DICT permeates issues related to the digital inclusion of learners and teachers; through the discussion about equal access to the network, requiring the formation of criticality for the emancipation of subjects (Freire, 2001). In this sense, the search to reduce online inequality goes beyond know-how, concerning the critical perceptions that are constructed of reality and the performance of these subjects not only as consumers of content, but as creators. According to Santos (2019), in the context of digital culture, knowledge is movement, possessing authorship, co-authorship, enabling interaction between authors. Therefore, the production of knowledge based on the principles of digital culture aims to transgress the reproduction of knowledge, encouraging students to exercise youth protagonism and the creation of knowledge networks.

EMERGING IDEAS FROM DIGITAL TECHNOLOGIES

The context of the Covid-19 pandemic was for many public and private schools a living laboratory of pedagogical experiences, with the wide use of digital technologies in the mediation of knowledge. The health crisis forced teachers and students to be inserted into virtual classrooms, requiring them to develop digital skills to pedagogically circumvent the situation (Santo; File; Oliveira, 2021). This process brought to light the need to adapt pedagogical planning and discover the possibilities of pedagogical use of digital technologies to continue the teaching work.

This context has led school institutions to reframe their view and systematically analyze the infinity of pedagogical possibilities of digital technologies. They presented a universe of opportunities in the pedagogical practice of teachers, allowing the use of digital interfaces to create interactive and dynamic learning environments for students. As a result, digital technologies have

become allies in the development of innovative and effective educational practices, driving an education that is more adapted to the demands and potentialities of the contemporary context.

From this perspective, digital interfaces are indispensable for the development of classes inspired by the principles of digital culture. For Sales and Albuquerque (2020), learners use numerous digital technologies in their daily lives to relate and produce in society. In the school environment, this reality needs to be present, this requires studies to analyze the possibilities of using digital technologies in the school context so that hybrid teaching practices can be developed. In this sense, Chart 1 will present some possibilities for bricolage digital technologies.

Additionally, we clarify that the term bricolage in science refers to "the ability to employ multiple research approaches and theoretical constructs, it is the path towards a new form of rigor in research" (Kincheloe; Berry, 2007, p. 10, *apud* Rodrigues, 2016, p. 02). In the words of the authors, "scientific or epistemological bricolage can be seen as a postmodern way of doing research that, in a way, contributes to the desecration or questioning of science as a closed, insurmountable field restricted to select and reserved circles" (p. 02). In the everyday context, DIY is about do-it-yourself jargon, from the mixture of the aspects of a device that gives rise to a new one. In this sense, its use in this study is quite appropriate to refer to the possibilities of creation and co-creation of content, based on different rereadings.

Table 1 - Mosaic of possibilities of digital technologies

Audio DIY	**Image & Video DIY**	**Mass communication**	**Video conferencing**	**Collaborative Learning/Online Teaching**
Creation, Recording, Mixing and Remixing.	Image creation, video, editing.	Creation of groups in messenger applications.	Real-time communication with multiple people.	Sharing, authoring, co-authoring.

Source: Prepared by the authors (2024)

Chart 01, divided into 5 (five) blocks, shows in general some possibilities of digital interfaces that allow audio DIY; image and video; mass communication; video conferencing; Collaborative learning/online teaching. The possibilities listed in this framework enable hybrid pedagogical practices, using the best of digital culture, intertwined with all the benefits of face-to-face teaching (Christensen; Horn; Stacker, 2013). This situation demands from teachers directions of the possibilities of DICT to favor a pedagogical praxis inspired by the principles of digital culture (Santos, 2019), allowing subjects to actively participate in the network, overcoming vertical communication, in which the author does not interact with the reader, seeking to establish a

relationship of horizontality, based on co-authorship, building knowledge in a shared and interactive way.

The possibilities of audio DIY allow learners (Sales; Albuquerque, 2020) the creation, recording, mixing, and remixing of audio. The possibility of remixing is emphasized, as it enables interaction between authors, enabling subjects to re-read original recordings. Also in this sense, it emphasizes the possibility of converting voice into text, proving to be relevant, for example, in the treatment of data from a scientific research, being able to automatically transform audio into text.

This possibility is very important for those who do an interview for their scientific research, using the recording of the conversation, who need to transcribe the speeches later. This process can be simplified by the facility provided by DICT. Still within the scope of the possibilities of DIY with audio of digital interfaces, the creation of a podcast stands out, based on a language close to the reality of the students in a dynamic and interactive way. Some interfaces allow the use of audio mixing resources at the time of recording, such as background music, applause, making it possible to broadcast in real time or record the content for later publication.

The creation of a *podcast* in the educational context makes it help in a positive way in the subjects' study routine, allowing them to create and reproduce complementary content of the subjects on their own cell phones, both in the school environment, in the classroom, on the school premises, in collaboration with groups of friends, and on the way to school. Podcasts are interesting digital interfaces to promote important debates, present different opinions and build self-learning. They stimulate the autonomy of the student, enabling him to develop youth protagonism, becoming a network content creator, developing a more active role in his study journey. Finally, these digital interfaces allow subjects to host material on educational platforms and share it, generating open educational resources, contributing to the exchange of ideas between teachers, students and other users of the network.

As possibilities of DIY with images and videos (Chart 1), we observed that these allow teachers and students to create, co-create and share content through static language, through photographs, stickers, or even through videos, *gifs*, languages that allow sharing on social networks, making the author meet the user. enabling co-authorship and interaction. DIY with images and videos is essential for creating content in the format and language of the main social networks, such as Instagram, Facebook, Youtube, Whatsapp, Tiktok, Kawaii, Twitter, among others.

These possibilities allow teachers to develop a pedagogical praxis contextualized with the reality of the learner (Freire, 2001), contributing to overcoming banking education and promoting a liberating education (Freire, 1974), encouraging youth protagonism in cyberspace (Santos, 2019).

In addition, we highlight the possibilities of mass communication provided by DICT (Chart 1), which can be exercised through the creation of groups in messenger applications to share content

in real time or asynchronously, enabling interaction between authors. In the educational field, they allow teachers to create specific groups for their subjects, as well as for pedagogical coordinators to create groups of student leaders, school boards, teachers, allowing the approximation and dialogue with the school community.

In addition, within the scope of the possibility of mass communication, we emphasize online forms, which are seen as great data collection devices for a given group, allowing the management of responses in a satisfactory way. Through them, teachers can carry out evaluation activities, providing multiple-choice questions, open-ended questions, image readings, etc. Through the online forms, pedagogical coordinators can carry out pedagogical surveys on socioeconomic issues, access to the students' internet to update the pedagogical political project of the school unit. Finally, the use of these possibilities in the school environment can contribute to the development of hybrid practices in accordance with the principles of digital culture.

Regarding the possibility of real-time communication, observed in Chart 01, its importance for the development of synchronous online classes is highlighted. The possibilities of videoconferencing are a strategy that students already experiment with on a daily basis (Sales; Albuquerque, 2020) to communicate and build their social relationships. Therefore, its use in teaching practice becomes a necessity, as it moves towards the promotion of an education mediated by DICT for a digital society.

In this sense, the possibilities of constructing learning collaboratively/online education, as pointed out in Chart 1, are important for the construction of knowledge by teachers and students in a participatory way. For Santos (2020), online education is an invention practiced in a network, in the daily life of joint education, co-author, maker of multiple forms, because in this aesthetics of learning to teach "form is content". For the author, online education should not be confused with distance education (EAD) and much less with emergency remote teaching. Distance education is a teaching modality provided for in Brazil, with its own methodology, with planning, teaching teams for the elaboration of content, training and tutoring. Remote teaching was the pedagogical strategy adopted by schools in the period of social physical isolation in the face of Covid-19, configuring itself as a mere transposition of face-to-face teaching to digital platforms.

Thus, the possibilities of digital interfaces are not new, but the direction of their potential for the mediation of teaching was somewhat amplified in the pandemic context, despite the fact that many public and private schools already make use of the potential of DICT in their pedagogical processes. However, studies on the use of DICT as learning mediation devices have highlighted new and successful pedagogical experiences in school contexts.

In this sense, Serres (2015) invites us to reflect on the subjects who are in the educational process in the era of digital information and communication technologies. The author points out that

young people with their thumbs master technologies in the palm of their hand, from the use of DICT to mediate their daily relationships. The role of the school in this context is not limited to teaching the student the procedural use of digital interfaces, but to re-signify the look at critical use, placing the student in this space as an active subject in the process of knowledge construction so that they exercise youth protagonism, and that the school surpasses banking education (Freire, 1974). Digital devices connected to the internet allow students and teachers to access too much information, requiring training from the school so that students can critically filter information, permanently combating the phenomenon of false information or *fake news* (Bauman, 2001).

In this way, the possibilities of digital audio DIY interfaces, allowing the creation, mixing and remixing of the file; DIYing in image and video, through the creation of images and videos; mass communication, through messenger applications, videoconferencing, through real-time communication, with several people at the same time and collaborative learning, online teaching favors the promotion of a hybrid education for a society immersed in digital culture, in which learners already use DICT in their daily lives to build knowledge.

SOME FINAL THOUGHTS

The study demonstrated that digital technologies are fundamental for the promotion of education based on the principles of digital culture, allowing students to interact with content on a network, going beyond the mere reproduction of knowledge. From them, students have the possibility of transforming cyberspace, leaving the limited phase of the beginning of the internet, emerging the pedagogical practice contextualized with the digital culture, in which knowledge is shared, created in collaboration, in a dialogical and horizontal perspective, allowing students to DIY in audio, video, images, among others.

In this sense, DICT is effective in favoring dynamic and interactive learning environments, allowing the development of hybrid teaching practices. Digital technologies enable learners to use the best of DICT, accompanied by all the benefits of the face-to-face classroom. DICT also allow the bricolage of audio, images, videos, allowing learners to create and co-create content on the network, proving to be relevant in the realization of videoconferences, allowing mass communication and the development of online education.

From this perspective, the digital inclusion of students is a crucial factor for the enjoyment of the pedagogical potential of digital interfaces in the teaching-learning process, demanding effective public policies in schools from the public authorities to create the conditions for access to devices, with internet connectivity for students and teachers, enabling hybrid teaching practice. Thus, the supply of the school with digital devices and access to the internet is a fundamental condition for the

development of pedagogical practices enriched by DICT, capable of promoting the emancipation of the student, immersed in the context of digital culture.

To this end, the outline of the theme presented here does not exhaust the discussions, in view of the growing development of new digital interfaces and the rise of generative artificial intelligences, which will require studies for their critical appropriation in pedagogical processes. In this sense, it is necessary to continue research in this perspective in order to deepen the studies, with a view to reporting the successful experiences of critical use of emerging technologies and their digital interfaces, capable of promoting hybrid and emancipatory pedagogical practices in the context of the present society.

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From chest pain to the feeling of anguish in affective and anxious patients

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ABSTRACT

Objective. Investigate differences between patients with and without anguish in terms of symptomatology and comorbidities and to find out whether patients with depression and with anxiety have more anguish than patients who do not have depression and anxiety. Method. A statistical analysis was carried out, which included a descriptive analysis that followed the verification of the distributions of the variables of the questionnaires in the groups, and an inferential analysis in which it was the dimension of some questionnaires was reduced and latent variables were constructed, possibly more discriminative in relation to the groups, and the variables with the greatest predictive power for anguish were identified. Results. The variables that most showed relationships with anguish were the following: Gender, Reduced Hamilton Score, BSI Somatization, Age and MINI Depression.

Keywords: Anguish, Precordial pain, Depression, Anxiety, Psychopathology.

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INTRODUCTION

Gentil & Gentil (2009) hypothesized that anguish could have clinical and neurobiological relevance.

Over the last few decades, anguish has been confused with fear, panic and anxiety. Anguish, which focuses on presente events, is accompanied by sensations in the thoracic region that can present themselves in the form of pain or tightness and many patients with depression and anxiety report this experience.

The word anguish goes back to the Latin verb angere, which means squeezing, compressing (especially the throat), strangling, choking, suffocating (López-Ibor, 2007).

In the scientific field, anguish arose when the word angst was inserted by Freud. However, angst was translated into anxiety (Strachey, 1934), because was a term which could be translated to "fear", "fright", "alarm". Thus, was concluded that 'anxiety' would also have a common meaning in everyday use, with only a remote connection with any of the uses of 'angst' and that it would be 'impractical' to settle on a single English term as a translation. exclusive, but that there would be a use already established by psychiatry that would justify the choice of the term "anxiety" (Freud, 1893/1996, p. 117).

The first consistent records of this human experience, which today is called anguish or anxiety, are found in the writings of pre-Socratic philosophers. According to Pessotti (1978, p. 7), they were the first to record more rational thoughts about anxiety, without using the word anxiety, obviously. Del Porto (2002, p. 4), in turn, states that in Roman Antiquity the philosopher Cicero already divided the field in question into two domains, anguish and anxiety. Anguish was something acute and transitory, while anxiety was a more or less permanent constitutional predisposition.

This ancient distinction, despite being formulated in a philosophical context, would have a great influence on the psychopathological field, especially on French psychiatrists at the end of the 19th century. Despite the possibility of making this reference to the ancient world, as well as in relation to the findings of numerous philosophical works on the subject throughout the Middle Ages and the Renaissance, it was only at the end of the 19th century and beginning of the 20th century, when the The concept of anxiety is established in the field of psychopathology, and the distinction between anxiety and anguish gains relevance, especially in the context of French psychiatry (Pereira, 2004, p. 11). Berrios (2008, p. 329), as part of a historical review of the concept of anxiety, shows that throughout the 19th century, anxious symptoms were studied in clinical areas such as cardiology, otorhinolaryngology, gastroenterology and neurology, and that, only at the end of the century, in the context of French psychiatry, were they brought together into a specific syndrome related to anxiety. At that time, anguish was conceived as suffocation, chest tightness, tachycardia and tremors; while anxiety was understood as distress, restlessness and indefinite terror.

Some authors considered that in addition to clinical importance, this separation had neurophysiological bases, with “anguish being a bulbar phenomenon and anxiety a cerebral phenomenon” (Brissaud, 1902, p. 762).

Brissaud defended the position that “angst is a brain stem phenomenon (bulbar phenomenon), anxiety is a cortical phenomenon (cerebral phenomenon): anguish is a physical disorder that manifests itself as a feeling of constriction and suffocation; Anxiety is a psychological disorder that manifests itself as a feeling of indefinable insecurity.” Brissaud mentions the clinical case of a patient who would have suffered from anguish without anxiety: “after more than a hundred attacks of severe chest pain, he maintained a philosophical attitude, lived day to day and never developed sadness or panic” (Berrios, 2008, p. 344).

Anguish was more visceral and static, and anxiety was more muscular and implied movement” (Del Porto, 2002, p. 5). Boven also proposed a gradation of intensity, reserving the term anguish for the most serious conditions. Here we find the familiar dichotomy between mind and body so dear to Western thought.

In 1895, Freud published the article “On the criteria for distinguishing a particular syndrome from neurasthenia entitled: anxiety neurosis” (Freud, 1895/1996).

The contribution of Freudian psychoanalysis to the problem of anxiety can be divided into two theories: Automatic Anguish and Signal Anguish (Hanns, 1996, p. 73). The theory of Automatic Anguish postulates the automatic transformation of repressed libido into anguish to maintain a minimum, or optimal, level of tension. It is understood that anguish is a mere physiological reaction to excess undischarged nervous excitement. It is an attempt to apply the principle of homeostasis to the nervous system and Fechner's Principle of Constancy to Psychopathology (Rocha, 2000, p. 52-53).

In the second theory, that of Signal Anxiety, it is understood that anguish consists of a signal triggered in situations of danger, functioning as an Ego device for anticipating instinctual emergencies (coming from the Id) through the production of a moderate dose of displeasure that prepares the subject for the task of repression according to the pleasure principle (Rocha, 2000, p. 11-13).

However, if from a nosographic and terminological point of view Freud does not distinguish anguish from anxiety, as he uses the term Angst to refer to both phenomena, Freud does so from a symptomatic point of view. It is possible to clearly see that, in his description of the clinical picture of Angstneurosis, Freud separates anguished expectation (anxiety) from a feeling of anguish.

The term Angstneurosis is translated into Portuguese both as “anxiety neurosis and as “anxiety neurosis”, indicating that anxiety and anguish are taken as synonyms, although the term anxiety neurosis is the most used; and when the distinction occurs, anguish is taken as the broader

term that includes anxiety symptomatology, that is, Angstneurosis is anxiety neurosis, a condition that brings together both anxious symptomatology and distressing symptoms.

Returning to the historical line of psychopathology, the distinction between anguish as a physical, acute, and more paralyzing phenomenon; and anxiety as a psychic, constitutional phenomenon and more restlessness, formulated by French psychiatry at the end of the 19th century, predominated for several decades. But, around 1945, Boutonier arguered that this separation was artificial and almost never observed in the clinic. Boutonier defended the use of only the word anguish, meaning simultaneously the physical and psychic aspect of the phenomenon: “anguish is an affective and organic state” (Boutonier, 1949, p. 41). This position is part of the humanist and philosophical tradition that understands anguish as part of the human condition itself, which has had great influence in the field of mental health, especially in psychoanalysis. It was the time of anguish, which consisted of a reference to the first half of the 20th century, a time in which the strong psychoanalytic influence in psychiatry would have been one of the reasons for the popularization of anguish and not anxiety (Pereira, 2004, p. 23).

According to Assumpção Júnior (1994, p. 17), the phenomenological view systematizes these differences as follows:

Figure 1. Differences between anguish and anxiety

	Anguish	Anxiety
Global bodily experience	Uncertain and immobilizing waiting	Restlessness
Localized bodily experience	Precordial or epigastric oppression	Dyspnea
Experience	Fear of sudden death	Fear of disastrous events
Time lived	Slowed	Accelerated
Individual space	Reduction	Exaltation
Basic feature	Viscera and physics	Psychic

Vieira & Neto (2024) investigated the relation between psychopathological symptoms and the diagnosis of depression and anxiety with the experience of anguish and concluded that anguish is more associated with depression than anxiety, being more frequent in females, and that the most frequent comorbidities among patients with anguish are somatization, fears, depressive mood, gastrointestinal and neurovegetative symptoms.

METHOD

The exploratory study involved 100 patients of anxiety and adult affective disorders outpatient clinics of the Institute of Psychiatry of the Faculty of Medicine of the University of São Paulo, with 50 patients belonging to the group with anguish and 50 to the group without anguish.

PARTICIPANTS

The sample was of 100 patients treated in the general, anxiety and adult affective disorders outpatient clinic of the Institute of Psychiatry of the Faculty of Medicine of the University of São Paulo, with 50 patients belonging to the group with anguish and 50 to the group without anguish. The reason for including affective and anxious patients in the sample is related to the objective of the research, to discover whether anguish is a feeling that is more focused on depression or anxiety.

ETHICS STATEMENT

The investigation was approved by the ethics committee of the Center of Studies and Research of Institute of Psychiatry of the Faculty of Medicine of University of São Paulo. All participants digitally signed an Informed Consent Form.

INSTRUMENTS

Sociodemographics

Participants answered sociodemographic questions anout age, gender, education level and marital status.

Brief Inventory of Psychopathological Symptoms

This inventory was developped by Derogatis (1982) and adapted for portuguese language by Canavarro (2007) and evaluates psychopathological symptoms related to nine different dimensions and culminates in a summary evaluation consisting of three Global Indices. The nine dimensions as follows: Somatization: includes items 2, 7, 23, 29, 30, 33 and 37; Obsessions-Compulsions: includes items 5, 15, 26, 27, 32, 36; Interpersonal sensitivity: includes items 20, 21, 22 and 42; Depression: includes items 9, 16, 17, 18, 35, 50; Anxiety: includes items 1, 12, 19, 38, 45, 49; Hostility: includes items 6, 13, 40, 41 and 46; Phobic Anxiety: includes items 8, 28, 31, 43 and 47; Paranoid Ideation: includes items 3, 14, 34, 44 and 53; Psychoticism: includes items 3, 14, 34, 44 and 53. For each BSI subscale, scores were significantly higher than the norms. The nine subscales exhibited acceptable-to-good Cronbach's alpha coefficients, varying from 0.733 for psychoticism to 0.875 for depression. Overall, the reliability of the entire instrument proved to be excellent (alpha coefficient=0.972). Furthermore, all BSI subscales as well as BSI synthetic indexes correlated with nomophobia in a significant way. Stratifying the population according to the severity of nomophobia (mild, 206 individuals, 51.1% of the sample; moderate, 167 subjects, 41.4%; and severe, 30 individuals, 7.4%), the GSI score could distinguish ($P<0.001$) between mild and moderate (0.99±0.71 vs 1.32±0.81) and between mild and severe (0.99±0.71 vs 1.54±0.79) nomophobia, although not between moderate and severe nomophobia ($P>0.05$). Similar patterns could be found for the other subscales of the BSI.

Finally, looking at the fit indexes, the second-order 9-factor model best fit the data compared with the Derogatis 1-factor model.

Defense Styles Inventory

Ego defense mechanisms, which is a psychoanalytic concept, have been defined as an indication of how individuals deal with conflict (Gallani et al., 2020). The defensive style is considered an important dimension of the personality structure of the individual and became the first psychoanalytic concept recognized by the DSM-IV13 as a guide for future research (Scaini et al., 2022). As for the psychometric properties of the DSQ-40, the internal consistency of the mature, neurotic, and immature defense styles was 0.70, 0.61, and 0.83, respectively. Additionally, the 3 defense styles had acceptable split-half reliability and test-retest reliability coefficients. Considering the concurrent validity, the mature defense style was negatively correlated with the symptoms of depression and anxiety, whereas the immature defense style was positively correlated with these symptoms. The neurotic defense style, on the other hand, had a positive correlation with anxiety symptoms, but did not reveal a significant correlation with depressive symptoms. The examination of criterion validity revealed results were consistent with our expectations. Significant differences were found in the expected direction between the control and clinical groups.

Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) is divided into two subscales: the anxiety subscale (tension or contraction, fear, worry, difficulty relaxing, butterflies or tightness in the stomach, restlessness, panic) – HADS-A and the depression subscale (anhedonia, difficulty finding humor when seeing funny things, deep sadness, slowness in thinking and performing tasks, loss of interest in taking care of one's appearance, hopelessness, lack of pleasure when watching television programs, radio or reading something) – HADS- D. Both contain seven items interspersed between questions regarding anxiety and depression. The factors and their corresponding items are shown below: Anxiety symptoms: items: 1, 3, 5, 7, 9, 11, 13. Depression symptoms: items: 2, 4, 6, 8, 10, 12, 14 All items are classified on a 4-point scale ranging from 0 to 3. Through these defined values, the HADS subscales can indicate the presence of anxiety or depression disorders at different levels: 0-7, normal; 8-10, light; 11-14, moderate; 15-21, serious. This scale, after studies and validation for the Brazilian population and the Portuguese language, has been widely used. The questionnaire is self-administered, and the evaluated subject can count on the help of the evaluator, who in the case of this work was always the same, if he did not understand the content of some questions. Twelve studies assessed the psychometric properties of the HADS-Total and its subscales HADS-Anxiety and HADS-Depression in COPD. High-quality evidence supported the structural and criterion validity of

the HADS-A, the internal consistency of the HADS-T, HADS-A, and HADS-D with Cronbach's alpha values of 0.73-0.87, and before-after treatment responsiveness of HADS-T and its subscales (minimal clinically important difference = 1.4-2; effect size = 0.45-1.40). Moderate-quality evidence supported the test-retest reliability of the HADS-A and HADS-D with excellent coefficient values of 0.86-0.90.

Hamilton Anxiety Scale

The Hamilton Anxiety Scale (HAM-A) contains fourteen items distributed in two groups, the first group with seven items related to symptoms of anxious mood; Insomnia; depressed mood: loss of interest, mood swings, depression, early awakening;) and the second group, also composed of seven items, related to the physical symptoms of anxiety (motor somatization; sensory somatization; cardiovascular symptoms; respiratory symptoms; gastrointestinal symptoms; genitourinary symptoms and neurovegetative symptoms). The HAM-A was tested for reliability and validity in two different samples, one sample (n = 97) defined by anxiety disorders, the other sample (n = 101) defined by depressive disorders. The reliability and the concurrent validity of the HAM-A and its subscales proved to be sufficient. Internal validity tested by latent structure analysis was insufficient. The major problems with the HAM-A are that (1) anxiolytic and antidepressant effects cannot be clearly distinguished; (2) the subscale of somatic anxiety is strongly related to somatic side effects. The applicability of the HAM-A in anxiolytic treatment studies is therefore limited. More specific anxiety scales are needed.

State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI) is a self-report scale that depends on the subject's conscious reflection in the process of evaluating their anxiety state, as well as their personality characteristics. State anxiety scores can vary in intensity over time, are limited to a particular moment or situation, and individuals with state anxiety tend to become anxious only in particular situations (Knowles & Olatunji, 2020). It is characterized by unpleasant feelings of tension and apprehension, consciously perceived, and can vary in intensity, depending on the danger perceived by the person and the change over time. Trait anxiety refers to relatively stable individual differences in the tendency to react to situations perceived as threatening with increases in the intensity of the anxiety state. It has a lasting characteristic in the person because the personality trait is less sensitive to environmental changes and because these remain relatively constant over time. The STAI-T has a valid and reliable psychometric instrument in terms of screening for anxiety disorders in PWEs. In the epilepsy setting, STAI-T maintains adequate sensitivity, acceptable specificity, and high NPV but low PPV for diagnosing anxiety disorders with an optimum cutoff score ≥ 52.

PROCEDURE

Anxious and depressed patients were invited to participate in the research, receiving an explanation about its objective and signed the Free and Informed Consent Form. Patients were asked to answer the Brief Inventory of Psychopathological Symptoms (BSI), the Defense Styles Inventory (DSQ-40), the Hospital Anxiety and Depression Scale (HADS), the Hamilton Anxiety Scale (HAM - A) and the State-Trait Anxiety Inventory (STAI). Patients were also asked to record a statement about the experience of anguish. This recording was listened to and analyzed to determine whether the patients were experiencing anguish or not.

DATA ANALYSIS

The statistical analysis included descriptive and inferential analysis. The first step of the descriptive analysis was the objective of comparing the groups with and without anguish with numerical and categorical variables. The second stage consisted of examining the variables of the questionnaires. The third stage included the comparison of the anxiety and depression symptoms most associated with anguish. The inferential analysis consisted of two stages. The first stage focused on reducing the size of some questionnaires and constructing more discriminative latent variables in relation to groups with and without anguish. In the second stage, the variables with the greatest predictive power for discomfort were identified.

RESULTS

Table 1 shows that only the variable BSI Somatization was considered significant and, among the categorical variables, the variables that presented the greatest significance were the variables gender, level of education, HAM- A Fears, HAM-A Depressive Mood, HAM-A Gastrointestinal Symptoms and HAM-A Neurovegetative Symptoms.

Table 1. Comparison of groups with anguish and without anguish with numerical and categorical variables using the Wilcoxon-Mann Whitney and Chi-square tests

Variable	P-value
Sex BSI Somatization	0,041 0,02
HAM-A Fear	0,003
HAM-A Depressed Mood	0,049
HAM-A Gastrointestinal Symptoms	0,025
HAM-A Neurovegetative Symptoms	0,018

Anguish affects more women than men. The descriptive level of the Chi-Square test (p=0.041) also contributes to the evidence of this association between anguih and gender. Regarding

marital status, it was found that there were no notable differences between the groups, with the sample being mostly single people.

Regarding the BSI questionnaire, only the distribution of the somatization variable was noticeably different between the groups. The median of the group with anguish is higher, in addition, the p-value of the Wilcoxon Mann Whitney test was significant (p = 0.02).

Regarding the HAM-A, the variables fears, depressive mood, gastrointestinal symptoms and neurovegetative symptoms showed significant differences for the variable anguish (individual significance level, Cronbach's α of 0.05), with the group with anguish being the one with the highest values of punctuation.

In summary, the variables that showed the greatest relationship with anguish were: gender, BSI somatization; HAM-A fears, depressed mood, gastrointestinal symptoms, and neurovegetative symptoms.

No variable related to anxiety was associated with anguish in this first descriptive context. As for depression, only the HAM-A variable, “depressive mood”, was significant. An analysis to compare the symptoms of anxiety and depression (using the MINI as a diagnosis) most associated with anguish was also carried out to discover what symptoms the two disorders have in common with anguish. The Wilcoxon Mann Wtihney and Chi-square tests show the association between the other variables and each of the three mentioned. Between anguish and depression, the variables BSI Somatization and HAM-A neurovegetative symptoms were considered significant, and between anguish and anxiety, only the HAM-A variable fears was significant.

Table 2. Significance comparative table

Variable	**Anguish (P-value)**	**Anxiety (P-value)**	**Depression (P-value)**
BSI Somatization	0,02 *	0,826	0,001*
BSI Obsession Compulsion	0,926	0,02 *	0,001*
BSI Interpersonal Sensitivity	0,828	0,023 *	0,008*
BSI Depression	0,724	0,407	0,001*
BSI Anxiety	0,72	0,032 *	<0,001*
BSI Hostility	0,571	0,208	<0,001*
BSI Phobic Anxiety	0,684	0,024*	0,001*
BSI Paranoid Ideation	0,621	0,321	0,001*
BSI Psicoticism	0,71	0,126	0,004*
DSQ Passive Aggression	0,341	0,069	0,049*
DSQ Acting Out	0,775	0,313	0,019*
DSQ Dissociation	0,539	0,002*	0,949
DSQ Somatization	0,693	0,015*	0,04*
HADS Anxiety	0,828	0,03*	0,015*
HADS Depression	0,504	0,224	0,005*
STAI Trait	0,761	0,002*	0,002*

HAM-A Total	0,129	0,065	0,003*

Table 3. Comparative table of the significance (Chi-square test) of symptoms and defense mechanisms of anguish with those of anxiety and depression

Variable	Anguish (P-value)	Anxiety (P-value)	Depression (P-value)
HAM-A Anxious Mood	0,953	0,054*	0,625
HAM-A Tension	0,417	0,15	0,043*
HAM-A Fears	0,003*	0,03*	0,184
HAM-A Depressed Mood	0,049*	0,231	0,084
HAM-A Respiratory Symptoms	0,323	0,132	0,029*
HAM-A Gastrointestinal Symptoms	0,025*	0,444	0,946
HAM-A Neurovegetative Symptoms	0,018*	0,494	0,023*
Depression Diagnosis	0,305	0,28	-
Anxiety Diagnosis	> 0,999	-	0,28
Other Diagnosis	0,228	> 0,999	0,588

The inferential analysis consisted of three steps. The first stage focuses on reducing the size of some questionnaires and the construction of latent variables, possibly more discriminative in relation to groups without distress and distress, and for this purpose the Item Response Theory was used. The second stage aims to identify which variables have the greatest predictive power for anguish. Item Response Theory (IRT) was used to reduce the size of the HAM-A and DSQ-40 questionnaires. For HAM-A, two scores were generated through IRT. The first (Hamilton TRI Score) was applied to all 13 variables, the second (Reduced Hamilton TRI Score) was applied only to the most significant variables for distress in the Chi-square tests and also of interest to the researcher, namely: HAM -A Fears, HAM-A Depressive Mood, HAM-A Gastrointestinal Symptoms and HAM-A Neurovegetative Symptoms. Two Scores were also constructed by simple sum: HAM-A Sum Score and HAM-A Reduced Sum Score, the latter being constructed by the variables mentioned above. Figure 12 shows the percentile graph of the HAM-A TRI score and HAM-A Sum score variables for the groups without and with anguish. It is possible to see two points by observing the graphs. The first is that the HAM-A questionnaire actually has a relationship with the variable anguish, the second is that the difference between the two methods is clear, in which the IRT proved to be superior to the simple sum in terms of discriminatory power. of the groups. The DSQ-40 has 3 latent variables according to the literature: Neurotic DSQ, Immature DSQ and Mature DSQ, which are described in the section dedicated to the description of the variables. The DSQ, both via the sum and via the TRI, appears to have no relationship between the groups with and without anguish. To investigate whether anguish is more related to depression than to anxiety, a logistic regression model was adjusted in which the response variable (dependent) was defined as having or not having anguish depending on many independent variables considered in the study. The model was adjusted without

the doubt group, therefore, for 85 observations, with the variable distress being the response variable and the following 23 explanatory variables: DSQ-40 mature TRI score; immature DSQ-40 TRI score; TRI neurotic DSQ-40 score; reduced Hamilton score TRI; IDATE State; IDATE Trait; MINI depression; MINI anxiety; MINI other diagnosis; BSI somatization; BSI obsession compulsion; BSI depression; BSI anxiety; BSI hostility; BSI phobic anxiety; BSI paranoid ideation; BSI psychoticism; BSI interpersonal sensitivity; HADS anxiety; Age; Gender; Education level; Marital status. The selected variables were the following: Gender, Reduced Hamilton Score, BSI Somatization, BSI Hostility, BSI Obsession Compulsion, Age and MINI Depression.

Table 4. Estimates of the coefficients of the Logistic Regression model

Parameters	**Stimate**	**Standard Error**	**P-value**
Intercept	2,7809	1,359	0,041
Depression (Ref.- Without depression)	1,294	0,773	0,094
BSI Somatization	0,090	0,052	0,086
Age	-0,044	0,018	0,013
Score HAM-A TRI Reduced	1,047	0,419	0,013
BSI Hostility	-0,143	0,067	0,033
BSI Obsession Compulsion	-0,118	0,065	0,070
Sex (Ref.– Male)	1,016	0,586	0,083

Table 5. Odds ratios of the logistic regression model with respective 95% confidence intervals

Variable	**Reference**	**Stimate (RC)**	**Confiance (95%)**
Diagnosis	No depression	3,640	[0,843 ; 18,363]
BSI Somatization	1 point increase	1,094	[0,989 ; 1,219]
Age	1 point increase	0,956	[0.921 ; 0.989]
Score HAM-A TRIReduced	1 point increase	2,849	[1.297 ; 6.856]
BSI Hostility	1 point increase	0,866	[0.753; 0.982]
BSI Obsession Compulsion	1 point increase	0,888	[0.776 ; 1.001]
Sex	Male	2,763	[0,897 ; 9,165]

Higher BSI Somatization scores are also associated with greater chances of having anguish, with each increase of one point in this domain the chance of anguish increases by 9.4%, keeping the other variables fixed. A 1-year increase in age reduces the expected chance of experiencing anguish by 4.6%, keeping other variables constant. The higher the HAM-A Score, the greater the expected chance of having anguish, that is, with each increase of one point in this Score there is an increase in the expected chance of anguish of 185%, considering the other variables in the model constant. For BSI Hostility, for each increase of 1 point, the expected chance of experiencing anguish decreases by 15.5%, keeping the other variables fixed. For BSI Obsession Compulsion, with each increase of 1 point, the chance of having anguish decreases by 12.6%, keeping the other variables fixed. The

expected chance of women experiencing anguish is greater compared to men (the chance for women is 2.76 times greater than that for men), considering other variables constant. The estimates obtained indicate that the expected chance of people with depression experiencing anguish is greater in relation to those who do not present this symptom (the chance for people with depression is 3.64 times greater in relation to people without depression), keeping the other variables in mind. fixed.

To measure the quality of the fit, the following metrics were evaluated: area under the ROC curve (Receiver Operating Characteristic), sensitivity, specificity, accuracy and residual analysis. Table 6 displays the first four metrics mentioned.

The area under the ROC curve is a measure that varies from 0 to 1, with the value 0.5 representing a model that would be completely random, that is, it is equivalent to deciding whether the patient has distress based on the result of launching a coin. The closer to 1, and consequently further from 0.5, the better the fit and the level of prediction of the model.

Sensitivity is the probability of a true positive in the prediction and specificity is the probability of a true negative in the prediction, therefore, in both metrics, the closer to 1 the better. Accuracy is the probability of correct classification in the prediction, therefore it is a measure that measures the model's total percentage of success. By these metrics, the model can be considered to be of reasonably good quality. To test the hypothesis H0: “the model is well adjusted” versus H1: The model is not well adjusted, we can also use the Pearson statistic, which, through the model residuals, calculates a chi-square statistic with $n – (p + 1)$ degrees of freedom, where n is the number of observations and p is the number of variables. The p-value of the chi-square statistic for the model in question was 0.157, therefore, we did not reject the H0 hypothesis that the model is well adjusted considering a 5% confidence level. A graphical analysis for Pearson and Deviançe residuals was performed. Pearson residuals are statistics that measure the difference between observed response frequencies and expected frequencies under the fitted logistic regression model. They are called Pearson residuals because the squared sum of these differences results in a Pearson Chi-Square statistic. Similarly, Deviance residuals are statistics that measure the difference between observed values and those predicted by the logistic regression model adjusted to the data, in this case, the residual formula.

DISCUSSION

This investigation aimed to prove the existence of differences regarding symptoms and comorbidities with regard to anguish, and that anguish is more related to depression than to anxiety. Based on the first hypothesis, it was concluded that the symptoms that are most linked to anxiety are: BSI somatization, HAM-A fears, HAM-A depressed mood, HAM-A gastrointestinal symptoms and HAM-A neurovegetative symptoms. Regarding the second hypothesis, it appears that of the 82

patients with depression, 87.2% had anguish, while of the 69 patients with anxiety, 69.2% had anguish, indicating a higher frequency of anguish among patients with depression.

Regarding the hypothesis of differences in symptoms and comorbidities between patients with anguish and patients without anguish, we can verify that the experience of anguish is related to somatic symptoms that include thoughts and emotional states in conflict and that cause pain in the body such as aches and pains. head, back and chest, stiffening of the limbs, tachycardia, among others. Among patients who experienced anguish, chest pain was the most frequent somatic symptom. As for the HAM-A variables that showed significance, a significant relationship was noted between the HAM-A variable depressed mood and the HAM-A variables gastrointestinal symptoms and HAM-A neurovegetative symptoms with regard to the experience of anguish. Another HAM-A variable that proved to be significant between patients with distress and patients without anguish was the HAM-A variable fears. Since patients who reported the experience of anguish complained of pain or tightness in the chest region, main characteristics of anguish, fear in this context is not fear of a specific object, such as an animal, natural environment or specific situation, but rather the fear of dying due to the experience of anguish. As Assumpção Júnior (1994, p. 17) argues, anguish is more related to the fear of sudden death. In relation to the gastrointestinal and neurovegetative symptoms which, together with the depressed mood symptom which proved to be significant in the context of the experience of anguish, the first involve problems that are related to the anguish, namely the burning sensation or heartburn, abdominal fullness, nausea and vomiting, while among the neurovegetative symptoms, the problems that are more related to anguish include pain, malaise, discomfort, burning, heaviness, tightness, swelling or distension in a specific organ, which in this case is the chest region . The Hamilton Anxiety Scale was also subjected, based on the application of Item Response Theory to dimensionality reduction to find more interesting properties than the simple sum of correct answers and it was concluded that, after dimensionality reduction, i.e. after selecting the HAM-A variables that are most related to anguish, these appear to be more significant compared to the simple sum of correct answers, indicating that, especially the variables HAM-A depressed mood, HAM-A fears, HAM -A gastrointestinal symptoms and HAM-A neurovegetative symptoms have significance regarding the experience of anguish. The greater significance of the Hamilton Anxiety Scale variables, as well as the BSI somatization variable, is also proven with the application of the Binomial Logistic Regression Model, which serves to select the independent variables and predict which group a patient is more likely to belong to. based on the independent variables.

As for the second hypothesis, which concerns the greater frequency of anguish among patients with depression compared to patients with anxiety, this can be proven based on the statements given by patients, which refer more to depression than to anxiety. Anxiety is a feeling that causes bodily sensations such as tightness in the chest in situations that occur in the present moment,

and the vast majority of patients declared having experienced anguish in present moments, such as loneliness, death of relatives, divorce, unemployment, high workload. work, difficulties in carrying out a task, sadness and thoughts about suicide, fear and insecurity, hopelessness, loss of control, problems related to work, family differences, despair, difficulty crying, physical illnesses, depression, travel, lack of emotional control, sad news, disappointments, bullying, parental rejection, political problems, feelings of oppression, crises due to psychiatric illnesses, stress, emotional pressure, accidents in the family, among others. Another result that reinforces the relationship between anguish and depression is given by the comparative analysis of significance, whose objective was to verify which variables are in common between anguish and depression and between anguish and anxiety, in which it was found that between anguish and depression, the common variables were BSI somatization and HAM-A neurovegetative symptoms, while between anguish and anxiety, only the HAM-A fear variable was common. This result reinforces the theory that anguish is more related to depression than to anxiety, since anguish is a feeling that encompasses somatic manifestations, reaching the conclusion that it is a visceral and physical feeling, while anxiety is a more psychic feeling. Based on the binomial logistic regression model, it is also possible to verify the greater significance among patients with depression compared to patients with anxiety regarding the experience of anguish, in which it can be concluded that, after applying the model, patients with depression have 3.64 more likely to experience distress than patients with anxiety. The biblical accounts also follow the direction of the relationship between anguish and depression, since the characters mentioned in the introduction to this research experienced, in addition to anguish, loneliness, fear, the desire to die and psychological suffering, that is, symptoms linked to depression.

Another result indicating a greater relationship between anguish and depression than between anguish and anxiety concerns gender, in which it is found that anguish has a greater presence in females, despite the sample being made up mostly of women. However, judging by the proportion of women and men who experienced anguish, it can be concluded that anguish exerts greater force among women. The relationship between the higher prevalence of anguish among females and depression is justified by the higher prevalence of depressive symptoms among women, since data indicates that women have twice as much depression as men and try twice as much to suicide. According to data from the Brazilian Ministry of Health, depression affects 14.7% of women, while men are affected by 7.3%.

Anguish is the combination of emotional and physical issues that can reach the limit of preventing human beings from carrying out daily tasks or causing isolation. It is a negative sensation that can trigger many other psychological processes that can also become physical. An anxiety crisis manifests itself when the person experiences profound suffering, caused by one or more situations that are difficult to overcome. It can also be the result of other psychological disorders, such as

anxiety, stress or depression. Anguish can be understood as a series of sensations that happen at the same time: physical sensations, such as shortness of breath, dizziness, pressure in the chest, accelerated heartbeat, and also psychological sensations, such as negative thoughts, guilt, crying, fear, sadness and anxiety. Also characterized by a strong negative feeling that seems to have no end, anguish usually appears without an apparent cause. It can cause physical symptoms such as tightness in the chest, feeling of a lump in the throat, weight on the shoulders and back of the neck, muscle tension, feeling of a hole in the stomach, among others. The feeling of anguish can be perceived as a state of depression, further intensifying the pain felt and can increase the risk of developing it. This anguish puts us in front of our own existence and fear, so the recognition of the freedom of our choices arises. Anguish is a disturbing and uncomfortable emotional manifestation that, because it manifests itself through symptoms similar to other problems, is often confused with anxiety, panic, depression and heart problems. Therefore, it is important to highlight the relevance that the concept of anxiety may have within the scope of HiTOP (Hierarchical Taxonomy of Psychopathology) and Rdoc (Research Domain Criteria). To this end, it is necessary to clarify both diagnostic systems. HiTOP comprises a new dimensional classification system for a wide range of psychiatric problems that has been developed to reflect cutting-edge scientific evidence. The diagnosis is important because it defines groups of patients who will receive treatment and public assistance. It is used by pharmaceutical companies to develop new drugs and guides overall research efforts. In recent years, there have been clashes over psychiatric diagnosis. The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) was published in 2013 and immediately divided medical opinion. The DSM-5 is an APA (American Psychiatric Association) guide on how to diagnose mental disorders. It has many critics, including the National Institute of Mental Health (NIMH), which in response has produced an alternative model to guide research efforts. However, this approach has also been controversial as it focuses heavily on neurobiology and much less on investigating issues important to everyday psychiatric care, such as symptoms and course of illness. The HiTOP system was articulated to address the limitations currently plaguing psychiatry. First, the system proposes to view mental health as a spectrum. Mental health problems are difficult to classify, as they are on the continuum between pathology and normality, just like weight and blood pressure. Applying an artificial threshold to distinguish what is healthy behavior versus mental illness results in unstable diagnoses because one symptom can change the diagnosis from present to absent. It also leaves a large group of people with symptoms that do not reach the threshold without treatment, although they suffer significant impairment. Secondly, the HiTOP system simplifies sorting. Different DSM-5 diagnoses co-occur with surprising frequency, with most patients labeled with more than one disorder at the same time. Furthermore, many diagnostic categories are so complex that often two patients with the same diagnosis do not share a single symptom in common. The HiTOP solution to

these fundamental problems is to classify the dimensions of psychopathology into several levels of hierarchy. This allows doctors and researchers to focus on more detailed symptoms or evaluate broader problems as needed. For example, social anxiety disorder is a category in the DSM-5, while the HiTOP model describes it as a graded dimension, ranging from people experiencing mild discomfort in some social situations (e.g., when giving a talk in front of a large audience) for those who are extremely fearful in most situations. The HiTOP system recognizes that clinical levels of social anxiety are not fundamentally different from regular social discomfort. It also does not treat social anxiety as a single problem, but recognizes important differences between interpersonal fears (e.g., meeting new people) and performance fears (e.g., performing in front of an audience). Additionally, people with social anxiety are prone to other anxieties and depression, and the HiTOP model describes a broad spectrum called internalization that captures the overall severity of such problems. Thus, while the narrow level of hierarchy may provide good targets for symptom-specific treatments (e.g., public speaking), the higher level of hierarchy is useful when designing comprehensive treatment packages and developing public health policies. Unlike the DSM-5, the HiTOP project follows the most up-to-date scientific evidence rather than relying on expert opinion. HiTOP effectively summarizes information about shared genetic vulnerabilities, environmental risk factors, and neurobiological abnormalities. For example, it is becoming increasingly clear that genetic risk factors do not adhere to diagnostic categories; rather, genetic research identifies broad genetic risk factors that cut across diagnoses and broadly align with the HiTOP dimensions (Kotov et al., 2017). As for RDoC, it consists of a research framework rooted in neuroscience with the goal of deepening understanding of the transdiagnostic biobehavioral systems underlying psychopathology and ultimately informing future classifications. The biobehavioral framework of RDoC can help elucidate the foundations of the clinical dimensions included in HiTOP (Casey et al., 2013). The contribution of distress to the HiTOP and RDoC diagnostic systems may be based on the results obtained from the research. It is concluded that anxiety is related to neurovegetative symptoms, which means that people who experience anxiety may present problems that include altered functioning, hyper- or hypo-functioning, such as palpitations, sweating, hot or cold flashes, tremors, as well as by expression of fear and disturbance at the possibility of a physical illness; gastrointestinal symptoms, and this group of symptoms includes problems such as chest pain, chronic and recurrent abdominal pain, dyspepsia, dysphagia, feeling of lump in the throat, halitosis, hiccups, nausea and vomiting; cardiovascular symptoms, which include problems such as pain or discomfort in the center of the chest, difficulty breathing, feeling sick, feeling faint, dizziness, cold sweat, paleness; as well as other symptoms such as somatization; fears and depressed mood. The main symptom of distress is the sensation of pain or constriction in the thoracic region that has an emotional origin. Both the research results and historical data lead to the conclusion that anguish

comprises a prelude to depression, and that it is not as linked to anxiety as initially believed, an idea that was based on the translation of the word angst to anxiety. Thus, anguish is important for psychopathology due to the fact that patients who experience the feeling also present problems such as chest pain and a feeling of strangulation or lump in the throat, as well as gastrointestinals, cardiovascular and somatic symptoms, fear, and depressed mood.

It is also important to reflect on the importance of anguish. Anguish is a disturbing and uncomfortable emotional manifestation, characterized by fear of the end, loss and emptiness, in addition to the feeling of profound helplessness. Its main symptoms are: constricted breathing, suffocation in the throat and chest, a feeling of emptiness, restlessness, pain in the heart region and an unconscious anxiety that something bad is going to happen. Anguish has its importance in the issue of self-knowledge and the development of emotional intelligence, vulnerability, lack of control and the art of relating to life, people and everyday situations. Human beings are born with the anguish of separation from their mother, the loss of security and an "eternal lap" and we die with the anguish of separation from people, life and the unknown, in other words, anguish is part of life and is natural It is healthy to live it, despite the discomfort. Anguish becomes pathological when the feeling of fear of loss, lack and end becomes oversized. This fear generates deep disbelief in relation to affection, new experiences, humanity and the act of existing and living life in a healthy and fluid movement. And we are afraid to act, afraid to follow and move towards the "new". Anguish triggers the mechanism: fear (paralysis/discomfort) X desire (aggression/pleasure). Anguish brings clarity to unconscious truths and reveals to us patterns, postures and conditioned thoughts. It awakens emotions rooted in our life history that often repeat themselves. It is a fundamental instrument for self-knowledge and human development. And, most of the time, it is the starting point of recurring emotional states and automated behaviors. Anguish signals the "tightening" of repressed emotions that need to be made aware and released. "And everything we resist, persists."

Future research can also stimulate conceptual analysis in the areas of psychiatry, psychology and other areas that are related to psychopathology, particularly that related to neurosciences, since the use of complex concepts in basic research, without their prior analysis, becomes sterile, which may be one of the causes for the scarce results in translational studies in psychopathology/neurosciences. It is also recommended that research be carried out with a larger database, as well as using more accurate strategies for diagnosing distress that provide greater precision in analyzes and greater discrimination of groups with and without distress and respective predictors.

The present study suffers from some limitations. First, socioeconomic status or ethnicity are not measured, but to our knowledge, they have not previously been associated with the experience of

distress. Secondly, the Portuguese version of the Psychopathological Symptom Inventory was used to the detriment of the lack of validation of this scale for the Brazilian population.

In summary, the present study suggests that the variables that were most related to anguish were: gender, reduced HAM-A score, BSI somatization, BSI hostility, BSI, obsession-compulsion, age and depression diagnosis. The inferential analysis showed evidence towards the main hypothesis of the investigation: “Depression is more related to anguish than anxiety”. It is worth highlighting the selection of the MINI depression variable using the stepwise method, which showed a significant association (at a level of 10%), with the interpretation that people with depression are more likely to experience distress compared to people who do not have depression. However, in the selection of variables most associated with distress, no variable related to anxiety was statistically associated with distress, with the exception of the domains of the Hamilton Anxiety Scale.

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Resistance and virulence factors of the *Staphylococcus aureus* - A brief review

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ABSTRACT

Introduction: *Staphylococcus aureus* is an opportunistic pathogen responsible for a wide range of infections in humans and able to rapidly adapt to anti-staphylococcal antibiotics and become resistant to several classes of antibiotics (multidrug-resistant). The biofilm- producing S. *aureus* has become notorious for causing several infections and chronic infections due to its ability to resist therapeutic treatment by forming biofilms on abiotic and biotic surfaces. This brief literature review discusses aspects of the antimicrobial resistance and virulence factors of the S. aureus. Methods: Literature searches were performed using PubMed indexed articles published between 2010 and 2023 to identify studies relevant to the review. Results: The success of MRSA is a consequence of the most virulence factors produced by S. *aureus* combined with β-lactam resistance and resistance to other antibiotic classes. S. *aureus* attachment to medical implants and host tissue, and the establishment of a mature biofilm, play an important role in the persistence of chronic infections. S. *aureus* has shown an increasing number of toxins and other virulence determinants produced by them, correlating with serious diseases. Conclusion: Antibiotic resistance and biofilm-forming capacity contribute to the success of S. *aureus* as a human pathogen in both healthcare and community settings.

Keywords: Biofilms, Methicillin-resistant *Staphylococcus aureus*, Multidrug-resistant pathogen, Review, Virulence.

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INTRODUCTION

Staphylococcus are Gram-positive cocci in clusters that produce catalase, nonmotile, nonspore-formation and facultative anaerobes. Is microbiologically characterized with a measurement of 0.5–1.5µm in diameter and is grouped as irregular cluster. The development of molecular techniques of research permitted to broaden nomenclature of species. The genus *Staphylococcus* numbers 72 species and 30 sub- species validated. Staphylococci are part of the physiological microbiota of the skin and the mucous membranes (nasal flora) of humans and animals. They are commonly associated with opportunistic infections, the impact of which is frequently enhanced by antimicrobial resistance [1,2,3,4].

Staphylococcus encodes for both the staphylococcal protein A and the coagulase enzyme; these two factors have diagnostic importance since they are used to differentiate coagulase-positive staphylococci (CoPS) from coagulase-negative staphylococci (CoNS). CoPS species, have a capacity to coagulate blood plasma of mammals [1,5,6]. CoPS including seven species: *Staphylococcus aureus*, *Staphylococcus delphini*, *Staphylococcus intermedius*, *Staphylococcus pseudintermedius*, *Staphylococcus lutrae*, *Staphylococcus schleiferi ssp*. coagulans and *Staphylococcus hyicus* [1,7].

In clinical practice, *S. aureus* is considered as the most virulent among Staphylococcus. Is an opportunistic pathogen responsible for a wide range of infections in humans, such as skin infections, pneumonia, food poisoning or sepsis. The natural reservoirs for *S. aureus* are humans. Historically, *S. aureus* was able to rapidly adapt to anti-staphylococcal antibiotics and become resistant to several classes of antibiotics. Methicillin-resistant *S. aureus* (MRSA) first emerged in 1961 and rapidly became a leading cause of nosocomial infections. Today, hospital-associated methicillin-resistant S. *aureus* (HA-MRSA) is a multidrug-resistant pathogen and is one of the most common bacteria responsible for hospital-acquired infections and outbreaks. The strain of MRSA found in hospitals are found in community settings as well (CA-MRSA) [1,7,8,9]. The biofilm-producing *S. aureus* has become notorious for causing several infections, such as endocarditis and sepsis, and chronic infections due to its ability to resist therapeutic treatment by forming biofilms on abiotic (indwelling medical devices) and biotic (cardiac tissue, cartilage and chronic wounds) surfaces. The biofilm-related antimicrobial resistance is partly due to the presence of some dormant *S. aureus* cells (also known as persister cells) encased by its biofilm. These cells maintain their dormancy during antimicrobial treatment and become active as soon as the treatment is withdrawn, thus causing a chronic recurrent infection. Biofilm-related infections are associated with increased morbidity and mortality (up to 66%), with infected medical devices often requiring surgical removal and increased durations of hospitalization. The challenge of developing therapeutics to treat staphylococcal biofilm infections is compounded by the existence of multiple biofilm mechanism in *S. aureus* [3,10,11,12,13].

This short literature review discusses aspects of the antimicrobial resistance and virulence factors of the *Staphylococcus aureus*.

METHODOLOGY

This is a narrative review study. Narrative reviews are informed by a broad analysis of the literature and make it possible to gain knowledge. Literature searches were performed using PubMed indexed articles published between 2010 and 2022 to identify studies relevant to the review. Search terms included: “Staphylococcus”, “Staphylococcus aureus”, “Staphylococcus aureus resistance” “Staphylococcus aureus virulence”, “Staphylococcus aureus biofilm”, “CA-MRSA” and “HA-MRSA”. The reference lists of all retrieved articles were checked for additional relevant references. Studies published in English was considered in this review.

RESULTS

STAPHYLOCOCCUS AUREUS

Staphylococcus aureus was first recognized as the etiological agent of suppurative abscesses more than 130 years ago. Today, is one of the most infamous and widespread bacterial pathogens, causing a hard-to-estimate number of uncomplicated skin infections and probably hundreds of thousands to millions of more severe, invasive infections globally per year. Is a common gram-positive human pathogen involved in both community-acquired and nosocomial infections, must array of virulence factors responsible for attaching, colonizing, invading, and avoiding host immune system [14,15,16].

S. aureus typical colonies are yellow in color – because of carotenoid pigments – smooth, slightly raised, and hemolytic (betahemolysis) from the hemolysin production on 5% sheep blood agar. Positive tests for catalase and coagulase and b mannitol deoxyribonuclease be used as identification method in laboratory. The selective culture medium commonly used is salty-mannitol agar, its hypertonicity helps to select *Staphylococcus* [3,17].

S. aureus stably colonizes human skin, nasopharynx and/or the perineum of approximately one-third of the human population, and it is estimated that around 15%– 30% of healthy adults are nasal carriers of S. aureus. However, *S. aureus* can also become an opportunistic pathogen, which replicates and disseminates to many different sites, responsible for a wide range of clinical diseases such as skin and soft tissue infections (impetigo, folliculitis or scalded skin syndrome), intravenous catheter-associated infections, food poisoning, toxic shock syndrome, osteomyelitis, pneumonia, endocarditis, deep-seated abscesses or bloodstream infections, which are associated with significant morbidity and mortality [7,14,18].

High levels of antibiotic use in healthcare settings selected strongly for HA- MRSA which reached levels of over 50% of all *S. aureus* isolated in some countries. HA- MRSA infections also were associated with higher mortality and prolonged lengths-of- stay compared with methicillin-sensitive *S. aureus* (MSSA) [19].

MRSA was initially recognized as a nosocomial pathogen. The first definite case of CA-MRSA was reported in 1993 in Western Australia. Subsequently, CA-MRSA was identified in the United States in children who died between 1997 and 1999. Currently, CA-MRSA strain USA300, a particularly successful PVL-positive CA-MRSA clone, is a major cause of CA-MRSA infections in the United States and Canada. In 2005, a variant of USA300 emerged in South America (Colombia) designated USA300 Latin American Variant and has spread rapidly. In Brazil, CA-MRSA is an emerging pathogen accounting for approximately one third of all *S. aureus* strains isolated from children with severe community-acquired infections, however these infections have been scarcely described. A study in Brazil has reported a 0.9% prevalence rate of CA-MRSA nasal colonization among healthy people living in the community [8,20,21].

STAPHYLOCOCCUS AUREUS RESISTANCE

The rapid acquisition, in few years, of antibiotic resistance by *S. aureus* is a significant problem for treatment of human infections caused by this organism (Figure 1). The resistance to penicillin, the first discovered beta-lactam antibiotic against *S. aureus* infection, was documented in 1942. Penicillin-resistant *S. aureus* (PRSA) began producing an extracellular beta-lactamase (penicillinase) enzyme, conferred by the blaZ gene, which inactivated the antibiotic through hydrolysis of the beta-lactam ring. The adaptability of the bacteria to fight antibiotics through mutations and other mechanisms led to penicillin resistance. Today, the vast majority of *S. aureus* isolates are resistant to penicillin. To counteract this resistance, in the late 1950s, new semisynthetic beta-lactam antibiotic was developed (methicillin). In 1961, the first report of resistance to methicillin, was already published in the United Kingdom. Since then, methicillin-resistant *S. aureus* – MRSA, has spread worldwide, and its prevalence has been increasing. By the 1970s, there was widespread resistance to this semi-synthetic group of penicillinase-resistant antimicrobial agents. MRSA has been isolated in community settings is characterized by multidrug resistance, being resistant, to varying degrees, to other antibiotics, such as macrolides, aminoglycosides, tetracyclines or fluoroquinolones [7,14,22,23,24].

Resistance is due to modified penicillin binding protein (PBP2a) encoded by the mecA gene. The presence of PBP2a confers resistance towards all beta-lactam antibiotics. The mecA gene is a mobile genetic element (Staphylococcal Cassette Chromosome mec - SCCmec) that can carry resistance genes to other classes of drugs, configuring the multidrug-resistant microorganism [9,22].

Since the first reports of SCCmec I, II, and III in the early 2000s, various SCCmec elements have been reported by different researchers worldwide, and in addition to being adopted as a molecular epidemiology tool in healthcare settings, these elements have been utilized in the research of the evolution of Staphylococcus. SCCmec is characterized by terminal repeat regions, two essential genetic components (the ccr gene complex (ccr) and the mec gene complex) and the junkyard (J) regions have been described. Based on the nature of the mec and ccr gene complexes, and further classified into subtypes according to differences in their "J" region DNA, fourteen different SCCmec types have been identified (I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII, XIII, XIV). The SCCmec element is inserted in the orfX locus of the *S. aureus* genome. HA-MRSA is found in SCCmec I, II, and III, while CA-MRSA is found in SCCmec IV or V and are susceptible to antimicrobials other than beta-lactams [9,22,23,25,26,27,28].

These resistant *S. aureus* to beta-lactam drugs can occur in healthy people who do not have classic MRSA risk factors. MRSA is developed when MSSA acquires and inserts a SCCmec (mecA) into their genome (Figure 2) [9].

In 2011, a novel mec gene type was discovered in *S. aureus* which shares approximately 70% nucleotide sequence identity with mecA. This mec homologue was designated as mecC. *S. aureus* isolates harbouring the mecC gene have been isolated from humans in different countries. The mecC is located in a new SCCmec cassette type XI and exhibits 63% homology identity to the PBP2a encoded by mecA [2,26,27].

Resistance to beta-lactam antibiotics has been observed in some mecA- or mecC- negative *S. aureus* isolates. Early studies from the 1980s attributed this low-level oxacillin and/or methicillin resistance to hyperproduction of beta-lactamase. Beta-lactamase produce by activation of a gene named as blaZ gene. Beta-lactamase hyperproducers (BHP), termed borderline oxacillin-resistant *S. aureus* (BORSA), regain susceptibility upon introduction of a beta-lactamase inhibitor [9,29].

A new antibiotic was then needed to treat these infections that did not require attachment to the PBP2a site. In 1958, vancomycin, a glycopeptide, being approved for use in humans, but was first used to treat MRSA infections in a hospital setting in the late 1980s. Resistance to vancomycin was discovered in enterococci in the 1980s, and in the 1990s, in Japan, the first case of reduced susceptibility of *S. aureus* to vancomycin was reported (vancomycin-intermediate *S. aureus* – VISA). Further studies indicated that the VISA phenotype is frequently preceded by an intermediate phenotype known in the clinical laboratory as heterogenous VISA (hVISA). An hVISA phenotype refers to a mixed cell population, derived originally from a single colony of S. aureus, in which most cells have little or no resistance to vancomycin and a sub-population of cells is resistant to the antibiotic at the level of VISA. With the continued use of vancomycin, the first case of vancomycin-resistant *S. aureus* (VRSA) was reported in 2002, in the United States. Complete vancomycin

resistance in *S. aureus* is conferred by the vanA operon. Vancomycin interferes with late-stage cell wall peptidoglycan synthesis by forming non- covalent hydrogen bonds with the penultimate D-alanyl-D-alanine. Cell wall synthesis is inhibited and bound vancomycin-pentapeptide complexes accumulate within the cell. There were also cases of hVISA, VISA, and VRSA infections reported from every continent [14,23].

Figure 1 - Timeline delineating the advent of antibiotic therapies and subsequent emergence of antibiotic-resistant *S. aureus.*

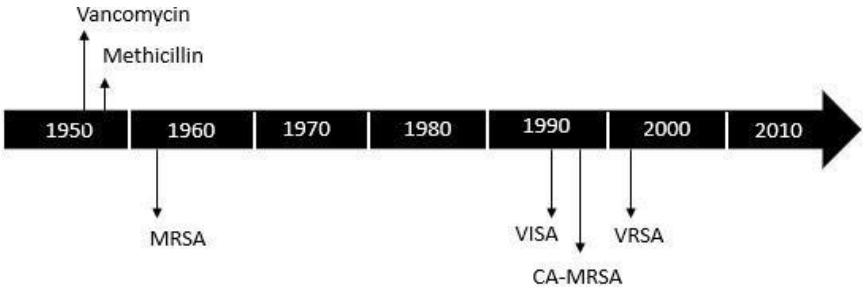
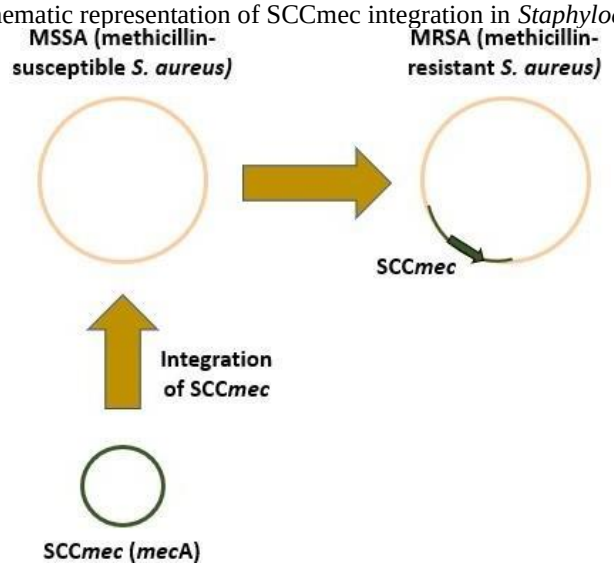


Figure 2 - Schematic representation of SCCmec integration in *Staphylococcus aureus*.



BIOFILM-PRODUCING ABILITY AND OTHERS VIRULENCE FACTORS

Bacterial biofilms are complex communities of organisms containing layers of bacteria within a glycocalyx. A mature biofilm contains specific three-dimensional structures referred to as towers or mushrooms separated by fluid filled channel. Biofilm- forming capacity contribute to the success of *S. aureus* as a human pathogen in both healthcare and community settings. The ability of *S. aureus* to form biofilms on implanted medical devices or damaged host tissue is also a key virulence factor for this pathogen, especially in healthcare settings where antibiotic usage is high and such biofilm formation represents a survival mechanism for the bacteria [30,31,32].

Similar to any other bacterial biofilm, *S. aureus* biofilm also has two distinct components – water (about 97%) and the organic matter which includes EPS and microcolonies. The EPS

constitutes about 50 to 90% of the total organic matter of a biofilm and is a complex of different polymeric substances, such as extracellular DNA (eDNA), proteins and polysaccharides. The major component of EPS is the polysaccharide intercellular adhesin (PIA), also known as poly-N-acetyl-glucosamine (PNAG). PIA are cationic in nature and play a significant role in colonization, biofilm formation and biofilm-related infections, immune evasion, resistance to antimicrobials and phagocytosis. *S. aureus* EPS also contains a range of proteins including accumulation associated proteins (Aap), surface binding protein A (Spa), fibrinogen binding protein (FnBP) A and B, extracellular matrix binding protein (Embp), amyloid fibers and *S. aureus* surface binding protein (SasG). In S. aureus, biofilm formation is mainly encoded by different genes, fibrinogen-binding proteins (fib) gene, fibronectin-binding proteins (fnbA and fnbB) genes, intercellular adhesion (icaA, icaB, icaC and icaD) genes, clumping factor (clfA and clfB), elastin binding protein (ebps), laminin binding protein (eno), collagen binding protein (cna) and bone sialoprotein genes. They are covalently linked to peptidoglycans of bacteria cell wall such as MSCRAMMs (microbial surface components recognizing adhesive matrix molecules), an important factor of biofilm production [3,12].

The main biofilm component, PIA, is synthesized by four genes, icaA, icaD, icaB, and icaC, encoded by the icaADBC operon (Figure 3) and mediates cell-to-cell adhesion and slime production. The transmembrane proteins, IcaA, and IcaD, work in concert as an N-acetylglucosaminyltransferase to synthesize PNAG oligomers that are less than 20 residues in length. IcaC is a membrane protein believed to transport IcaAD-synthesized oligomers across the cell membrane. IcaC is also involved in the formation of long oligomers of PIA/PNAG. The IcaB protein, which can be found in association with the bacterial cell surface and culture supernatants, deacetylates PIA/PNAG resulting in a positively charged polymer. Deacetylation is believed to promote the interaction of PIA/PNAG with the negatively charged cell surface. A fifth gene, icaR, is a negative regulator of icaADBC [12,30,32].

Using clinical isolates of S. aureus, was reported that MRSA strains express an icaADBC-independent biofilm phenotype *in vitro*, which is instead dependent on the fibronectin binding proteins (A and B) and the major autolysin (Atl) [10].

The pathogenic lifestyle of *S. aureus* is facilitated by a wide array of virulence factors, including toxins, proteases, adhesins, and immune-modulatory factors. *S. aureus* produces an arsenal of pore-forming toxins (PFTs) that kill host cells, thereby combatting immune responses and liberating nutrients from the host. The three major PFTs are: alpha-hemolysin (or Hla), Panton-Valentine leukocidin (PVL), and leukocidin AB. *S. aureus* exhibits several other virulence factors, such as catalase, coagulase, protein A, and many other toxins that contribute to its pathogenicity and enable it to escape from the host's immune system [25,33,34].

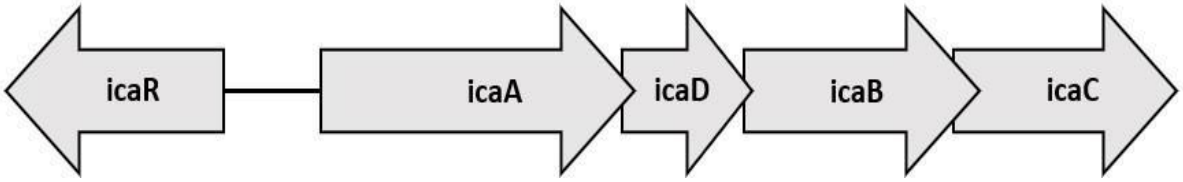
Alpha-hemolysin – Hla, was the first recognized PFT and is regarded as a key virulence factor of S. aureus. Is a toxin extremely conserved (99%), core genome-encoded cytotoxin that assembles into a homo-heptameric pore. Alpha-toxin contributes to *S. aureus* pathogenesis of skin infection and pneumonia, inhibits macrophage phagocytosis, and promotes death of these phagocytes in concert with secreted LukAB. Alpha-toxin also upregulates host autophagy, allowing *S. aureus* to become tolerated by the host by downregulating expression of the toxin receptor [33,35].

PVL is an exotoxin shows strong lytic activity against host defense cells such as human polymorphonuclear neutrophils, monocytes, macrophages, and rabbit neutrophils but not murine neutrophils *in vitro*. Pore formation requires the presence of the two components of the toxin, LukS-PV and LukF-PV, encoded by lukS-PV and lukF-PV genes. PVL aggravates many infections, such as skin and soft tissue infection, necrotizing pneumonia, bone joint infections, and even bacteremia. The prevalence of the pvl gene has been less common in MSSA isolates than in MRSA. The pvl gene locus represents a stable genetic marker of CA-MRSA strains [36,37].

While others leukocidins are secreted toxins, Leukocidin AB (LukAB) is found both secreted into the extracelular milieu and associated with the bacterial cell envelope. The sorting of LukAB follows a multistep process controlled by the cell envelope, resulting in differential deposition of the toxin on the bacterial cell or into the extracellular milieu, dependent on growth conditions. LukAB, appears to be the major toxin responsible for primary human polymorphonuclear leukocyte (PMN) cell death during tissue culture infection and impairs function of and kills antigen presenting cells thus potentially reducing the host defense and immunological memory needed to combat current and subsequent infections [34,38,39].

CA-MRSA usually differ from HA-MRSA by the fact that they carry a phage encoded toxin called Panton-Valentine Leucocidin (PVL) [8,9].

Figure 3 - Organization of the intercellular adhesion (ica) operon in *Staphylococcus aureus*.



CONCLUSION

A high prevalence of antimicrobial resistance not only to methicillin but also to other antimicrobials was thought to have correlations with the inappropriate use of antimicrobials, so the prevalence of MRSA is still used as an indicator of good infection control and prevention practices and appropriateness of antimicrobial practice. The rapid and accurate diagnosis of antimicrobial resistance in *S. aureus* is crucial to the early initiation of directed antibiotic therapy and to improve

clinical outcomes for patients. *S.* aureus is an important pathogen that causes a variety of infections. The ability to develop biofilms varies among different *S. aureus* isolates. The formation of biofilms on indwelling medical devices enables *S. aureus* to evade host immune responses and establish chronic infections. Multiple environmental factors, including nutrients, antibacterial agents, pH, temperature, and so on can induce stress responses and can profoundly affect the stages of biofilm formation, including initial attachment, maturation, and detachment. The formation of a biofilm decreases the susceptibility to antimicrobials and immune defenses, making these infections difficult to eradicate. An understanding of colonization, transmission, risk factors for progression to infection and conditions that promote the emergence of resistance will enable optimization of strategies to effectively control MRSA.

DISCLOSURE STATEMENT

The authors disclose any financial and personal relationships with other people or organizations that could inappropriately influence their work. All authors declare that they have no competing interests.

AUTHOR CONTRIBUTIONS

All the authors of this review wrote the manuscript.

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Transforming knowledge into action: The synergy between climate education and youth activism

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ABSTRACT

Climate change poses an urgent challenge, impacting ecosystems and societies globally. Climate education (EduClima) emerges as an essential tool to empower young people to understand and act on climate issues. Movements such as Fridays for Future, led by young people such as Greta Thunberg, highlight the importance of youth activism in the fight against climate change. This chapter explores the interconnectedness between climate education and youth activism, arguing that an integrated approach is essential to addressing the climate crisis effectively. Climate education not only informs but also inspires action, preparing young people to become leaders in the pursuit of a sustainable future. However, challenges such as unequal access to education and institutional resistance must be overcome. Strategies such as the continuous training of educators and the use of digital technologies can strengthen climate education and youth activism, promoting a more resilient and conscious society. Collaboration between governments, NGOs and educational institutions is crucial to amplify the impact of these initiatives. This study concludes that climate education and youth activism are essential to promote a sustainable and resilient future, empowering young people to lead the fight against the climate crisis with knowledge and determination.

Keywords: Climate change, Climate education, Youth activism, Sustainability.

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INTRODUCTION

Climate change represents one of the greatest challenges of the 21st century, impacting ecosystems, economies and societies on a global scale. Phenomena such as heat waves, floods, droughts, storms, and forest fires have become more frequent and intense, exacerbated by human activities that alter natural systems (Nusche et al., 2024). These extreme weather events not only threaten environmental sustainability but also the survival and well-being of human populations. The Intergovernmental Panel on Climate Change (IPCC) warns that the window to avoid the worst impacts of climate change is rapidly closing, emphasizing the need for immediate action to mitigate and adapt to these changes (IPCC, 2021).

In this context, climate change education (EduClima) emerges as an indispensable tool, empowering young people to understand and act on climate issues (Fletcher, 2023). According to UNESCO (2021), climate change education is essential to enable young people to understand the science behind climate change, recognize the urgency of the situation, and adopt effective measures to mitigate and adapt to these impacts. According to UNESCO (2021), the integration of climate education into school curricula is essential to develop critical awareness and practical skills in young people, preparing them to act as agents of change. In many countries, initiatives to incorporate climate education into education systems have gained momentum, highlighting the crucial role of education in transforming students' perceptions of the environment and preparing for future challenges.

At the same time, youth activism has emerged as a powerful force in the fight against climate change. Movements such as Fridays for Future, initiated by Greta Thunberg, have mobilized millions of young people around the world to demand concrete action from governments and international institutions (Igini, 2022). Greta Thunberg, in a hard-hitting speech at the UN Climate Action Summit in 2019, stated: "You have stolen my dreams and my childhood with your empty words. And yet, I'm one of the lucky ones. People are suffering. People are dying. Entire ecosystems are collapsing" (Thunberg, 2019). This movement underscores the importance of giving young people a voice in climate policymaking and recognizes their crucial role in promoting social change. Young people who are well-informed and educated about climate issues are more likely to get involved in actions and social movements that seek to mitigate the impacts of climate change. As highlighted by O'Brien et al. (2018), education is a key factor that can transform the potential of youth activism into a powerful force for social and political change.

The interconnection between climate education and youth activism is evident. Climate education not only informs but also inspires action. Youth-led movements, such as Fridays for Future, have demonstrated that youth are a significant force in the global fight to preserve the environment.

However, the challenge is not only to educate, but also to motivate and empower young people to take action. Climate change education must go beyond the classroom, connecting academic learning with practical action and activism. Educational programs that involve students in sustainability projects and awareness campaigns can strengthen youth engagement and participation. Case analysis of extreme weather events, educational programs, and youth movements highlights the need to prepare future generations for environmental challenges and empower young people to become leaders in the pursuit of a sustainable future.

This chapter explores the interplay between extreme weather events, climate education, and youth activism. It is argued that an integrated approach, which combines educational capacity building with youth mobilization, is essential to effectively address the climate crisis. By exploring case studies and recent evidence, the chapter seeks to demonstrate how climate education and youth activism can together build a more resilient society prepared for future challenges. Through a case analysis of extreme weather events, educational programs and youth movements, the need to prepare future generations for environmental challenges and empower young people to become leaders in the pursuit of a sustainable future is highlighted.

Moreover, the impact of youth activism goes beyond simple awareness-raising. Young activists have been pushing world leaders to take more ambitious and responsible climate action. The influence of movements such as Fridays for Future shows that young people are not only victims of climate change, but also active agents of change. They are redefining the narrative and demanding concrete action for a more sustainable future.

Therefore, climate education and youth activism are complementary and interdependent. Together, they form a powerful approach to tackling the climate crisis. Education empowers young people with the necessary knowledge and skills, while activism channels this empowerment into concrete actions. Thus, the combination of these forces is essential in the fight against global warming and climate change.

EXTREME WEATHER EVENTS AND THEIR IMPLICATIONS

Extreme weather events have become increasingly frequent and intense due to climate change. According to the Intergovernmental Panel on Climate Change (IPCC), the increase in global temperatures is directly related to the increase in the frequency and severity of phenomena such as heat waves, droughts, floods, and storms (IPCC, 2021). Not only do these events cause immediate and visible damage, but they also have long-lasting implications for affected communities. Scientists attribute this significant increase to climate change caused by human activity, especially the emission of greenhouse gases. Understanding the relationship between these events and climate change is crucial for effective policymaking and mitigating future impacts.

Extreme weather events are characterized by significant deviations from normal weather conditions, occurring over short, specific periods. Climate change, on the other hand, refers to the long-term changes in Earth's average weather patterns, including temperature, precipitation, winds, and ocean currents (Nusche et al., 2024). These long-term changes not only influence the frequency but also the intensity of extreme weather events.

Over the past twenty years, the number of climate-related disasters has increased substantially, with floods and storms being the most common events. Recently, droughts, wildfires, and extreme temperatures have also become more frequent and severe. While low-income countries are the most impacted, climate risks are growing in high-income countries as well. In 2018, developed countries faced severe heatwaves and droughts, with Europe experiencing a drastic increase in the incidence of extreme heatwaves, making these events up to 100 times more likely than a century ago (Nusche et al., 2024).

The impacts of climate change are widely documented and demonstrate a pattern of increase in extreme events. For example, a child born in 2024 is expected to experience a significantly higher number of extreme weather events over their lifetime compared to one born in 1970, including three times as many river floods, twice as many tropical cyclones and wildfires, four times as many crop failures, five times as many droughts, and 36 times as many heat waves (Thiery et al., 2021).

Rising average global temperatures intensify the hydrologic cycle, resulting in increased evaporation and precipitation. This could lead to more severe droughts in some regions and torrential rains in others. This global warming affects climate systems in a number of ways, including the melting of polar ice caps and glaciers, contributing to sea level rise. This increases the risk of coastal flooding and habitat loss for human communities and wildlife. The National Aeronautics and Space Administration (NASA) says global sea levels have risen by about 20 centimeters in the last century. The rate in the last two decades of this century, however, is almost double that of the last century and accelerates slightly every year. (NASA, 2019).

The oceans absorb most of the additional heat, which affects the formation of storms and hurricanes. Warming oceans can intensify the strength and frequency of these events, leading to significant destruction of infrastructure and loss of life. According to the US National Oceanic and Atmospheric Administration (NOAA), in the last three years (2021-2023) in the United States there have been 66 extreme weather events, which cost 437.9 billion dollars and resulted in 1690 deaths (NOAA, 2024). Climate change can alter established weather patterns, leading to greater variability and extremity of weather events. For example, heat waves may become more frequent and long-lasting, while extreme cold events may occur more sporadically.

According to the World Meteorological Organization (WMO), 2023 was the hottest year on record in the last 174 years. In addition, the last nine years, from 2015 to 2023, were the warmest in

history (Inmet, 2023). This warming is largely attributed to rising concentrations of greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, which reached record levels in 2022 and continue to grow in 2023 (Inmet, 2023).

The World Meteorological Organization released data, covering the period from 1970 to 2021, in its Atlas of Mortality and Economic Losses from Weather, Climate and Water-Related Hazards. According to the WMO, extreme winds related to weather, climate and water caused almost 12,000 disasters between 1970 and 2021; reported economic losses are $4.3 billion and increasing; The death toll stands at 2 million, 90% of which are in developing countries, however, it highlights that death rates have fallen thanks to early warnings. (WMO, 2023)

Heat waves are one of the most obvious examples of the impact of climate change. Studies indicate that the number of extreme heat days has increased significantly in recent decades, and is expected to continue to increase (Hoegh-Guldberg et al., 2018). One example is the heatwave that affected the Pacific Northwest and western Canada in 2021, pushing temperatures to levels never before recorded in the region. This extreme event resulted in hundreds of deaths, widespread wildfires, and infrastructure collapses due to the heat. Between June 25 and July 1 alone, 619 extreme heat-related deaths were reported. During this period, Western Canada experienced temperatures up to 20°C above normal, with more than 103 all-time heat records being recorded, including Canada's highest temperature ever measured in Lytton, 49.6°C on June 29, 2021. The entire town of Lytton subsequently burned in a wildfire the next day. (Government of Canada, 2022)

Similarly, floods have become more common and devastating. Heavy rainfall, combined with rising sea levels, result in flooding that affects millions of people globally.

Major storms occurred in September 2023 that began with a typhoon that devastated Hong Kong, followed by a series of extreme weather events in ten countries in just 12 days. Scientists warn that these events could become more common as the climate crisis advances, putting pressure on governments to better prepare. The cost of flooding highlights the urgent need for preparedness, especially in the poorest and most conflict-ridden countries. Hurricane-like storms battered the Mediterranean region, with heavy rainfall in Greece and Turkey causing death and destruction. Libya was badly affected when two dams broke, resulting in a 7-meter wave that devastated the city of Derna. The floods in Libya have been catastrophic, killing more than 11,000 people and leaving thousands missing The impact has been amplified by poor infrastructure and inadequate warnings, compounded by the climate crisis, making recovery more difficult (Yeung, 2023).

The impacts of extreme weather events are particularly severe on vulnerable communities. Natural disasters result in direct health impacts, such as deaths, injuries, and waterborne illnesses. In addition, prolonged droughts affect food security as they reduce agricultural production and increase food prices (FAO, 2020). The Food and Agriculture Organization of the United Nations (FAO) also

highlights that "extreme weather events are one of the main causes of food crises in many countries" (FAO, 2021). Not only do these events cause immediate destruction, but they also have long-lasting effects, such as the displacement of populations and the degradation of natural ecosystems.

The World Bank warned in a 2018 report that by 2050, climate change will force tens of millions of people to migrate internally in three regions: sub-Saharan Africa, South Asia and Latin America, which account for 55 percent of the population of developing countries. Without concrete action, more than 143 million people, or 2.8% of the population in these regions, could be displaced due to climate impacts. Migrations will occur from areas with less water, lower agricultural productivity, and affected by sea level rise and storms (World Bank, 2018).

Ecosystems also suffer due to extreme weather events. Bushfires, such as those that occurred in Australia in 2019-2020, have destroyed millions of hectares of natural habitat, putting several species at risk of extinction. This 2019–20 bushfire season in Australia was marked by unprecedented wildfires that caused extensive damage to many communities. In a period of severe and prolonged drought, the impact on the natural environment was especially devastating; Scientists have estimated that nearly 3 billion native vertebrates were affected in the forests and woodlands burned during this time. Thirty-three people lost their lives. There have been significant property losses, as well as threats to lives and property that have forced many people to evacuate their homes. Smoke from the fires blanketed parts of Australia, leading to public health recommendations for people to remain in their homes (AIHW, 2020). Not only do these fires alter ecosystems, but they also contribute to soil degradation and reduced air quality.

A significant example of an extreme weather event is Cyclone Idai, which hit Mozambique, Zimbabwe, and Malawi on March 15, 2019. This cyclone was one of the most powerful and devastating ever recorded in the Southern Hemisphere. On the night of March 14-15, 2019, Cyclone Idai made landfall in the city of Beira, Mozambique, resulting in the deaths of more than 1,000 people in Mozambique, Malawi, and Zimbabwe, as well as leaving an estimated 3 million people in urgent need of humanitarian assistance. The catastrophic damage, caused by high winds and extensive flooding, destroyed crops and seed stocks. Millions of people have lost their homes and livelihoods. After one year, more than 8.7 million people still faced a lack of sufficient food or water, and more than 100,000 people in Mozambique remained living in temporary shelters (OXFAM, 2020).

Brazil, in 2023, faced 12 extreme weather events, of which nine were considered unusual and two unprecedented. These events included five heat waves, three heavy rains, one cold snap, one flood, one drought and one extratropical cyclone. Among the most significant events was an unprecedented heatwave that hit the Amazon in July 2023, contributing to one of the worst droughts ever recorded in the region (UN, 2024).

At the end of August 2023, temperatures exceeding 41 °C were recorded in Rio de Janeiro and São Paulo, causing a significant impact on public health and the environment. The resulting drought in the Amazon led to the deaths of more than 150 pink dolphins in Lake Tefé and contributed to a record 22,061 fires in the region in October, the highest number since 2008. Smoke from these fires severely impacted air quality in Manaus (UN, 2024).

Rio Grande do Sul also suffered severely from extreme weather events in 2023. An extratropical cyclone caused heavy rains and strong gusts of wind, resulting in 46 deaths, 46 missing and 340,000 people affected. The subsequent floods caused destruction in several cities, especially in the Taquari Valley region, where 92 municipalities declared a state of public calamity (UN, 2024).

In May 2024, the state was still facing the consequences of heavy rains that caused deaths, disappearances, and a large number of homeless people. Classes were suspended in 2,338 schools in the state network, affecting more than 338 thousand students, with many schools damaged or serving as shelters for the displaced (Lima Neto, 2024). The situation in the state, as of May 18, 2024, included 155 deaths, 94 missing, 806 injured, 77,202 homeless, and more than 2 million people affected in 461 municipalities out of a total of 497 (RS. Gov,2024)

The global outlook, as indicated by the studies of Poynting & Stallard (2024), suggests that the future will be marked by even more extreme and frequent weather events. Rising global temperatures are directly associated with more intense rainfall, prolonged droughts, and more severe heatwaves, contributing to a vicious cycle of weather events that feed off each other.

To meet the challenges of extreme weather events, it is essential to adopt mitigation and adaptation strategies. Reducing greenhouse gas emissions is key. Transitioning to renewable energy sources, increasing energy efficiency, and adopting sustainable practices are other essential measures to reduce global emissions. Additionally, investing in resilient infrastructure, such as flood-proof buildings and early warning systems, can minimize the impacts of extreme weather events.

According to the United Nations Development Programme (UNDP), climate change adaptation involves actions that aim to reduce vulnerability to the present or future impacts of climate change, such as extreme weather events, sea level rise, biodiversity loss, and food and water insecurity. It highlights that it is essential to develop adaptation policies that help communities adjust to these changes. This includes the creation of land use plans, the management of water resources, and the implementation of resilient agricultural strategies, all of which are key to increasing the resilience of the most vulnerable communities (UNDP, 2024a).

The current trend indicates that extreme weather events will continue to increase in frequency and intensity unless significant action is taken to mitigate climate change. The 2021 IPCC report emphasizes that limiting global warming to 1.5°C is crucial to reducing the risks associated with these extreme events (IPCC, 2021). Preparedness and adaptation of communities and infrastructure

are essential to minimize future impacts. Immediate and coordinated action at the global, regional and local levels is essential to reduce risks and prepare societies to face the challenges that are already manifesting themselves and that are likely to intensify in the future.

Those who will suffer the most from the impacts of climate change, today's young people, are aware of what is happening and becoming increasingly anxious about their future. According to the United Nations Environment Programme (UNEP), eco-anxiety is on the rise, especially among young people. A 2021 global survey of 10,000 young people in 10 countries revealed that more than 50% of them feel sad, anxious, angry, powerless, helpless and guilty about climate change, and 45% said these feelings negatively impact their daily lives. The countries of greatest concern tend to be the poorest, especially in the global south or north, which are directly affected by climate change (Modeer & Otieno, 2022).

This reality imposes significant challenges on education systems, as advocated by Nusche et al. (2024), where it is imperative to prepare new generations to face and mitigate the impacts of climate change. Education for sustainability and disaster management becomes a fundamental part of building a more resilient society prepared for the challenges of the future.

The increasing frequency and intensity of extreme weather events underscore the importance of educating future generations about climate change and its implications. The current climate situation highlights the urgency of effective actions to mitigate the impacts of climate change. Extreme events are not only more frequent, but also more severe, affecting millions of people around the world. The response to this crisis must be comprehensive, involving rapid and unprecedented changes in all aspects of society, as highlighted by the International Panel on Climate Change (UNESCO, 2020). Adapting education systems and preparing for future climate crises are crucial to ensure communities' resilience and long-term environmental sustainability.

Climate change education becomes key to preparing young people to understand and address environmental challenges. Understanding the science behind extreme weather events allows young people to recognize the urgency of the climate crisis and feel empowered to take action. In addition, climate education can inspire action by promoting awareness of the importance of adopting sustainable practices and pushing for public policies that mitigate the effects of climate change. Therefore, the integration of climate education into school curricula is essential to develop a generation that is prepared to face and mitigate environmental impacts, contributing to a more resilient and conscious society.

FUNDAMENTALS OF CLIMATE EDUCATION

Climate education is key to empowering future generations to understand, confront and mitigate the effects of climate change. It is not limited to the mere transmission of information, but

aims to engage students in learning processes that develop critical, civic and problem-solving skills necessary to promote sustainability. As defined by UNESCO, climate education is an educational process that seeks to integrate knowledge about climate change into school curricula, promoting a holistic understanding of the causes, impacts, and solutions to the global climate crisis (UNESCO, 2021a). Its goal is to prepare students to make informed decisions and actively participate in climate change mitigation and adaptation.

In the context of climate change, education emerges not only as a fundamental right, but as an indispensable tool to enable future generations to face imminent environmental challenges. Fletcher (2023) highlights the urgent need to integrate environmental education into schools, stressing that a solid education on climate issues prepares young people to protect vulnerable ecosystems and mitigate the effects of global warming. This need is amplified by the planetary crisis described by UNESCO (2022), which points to climate change, biodiversity loss, and pollution as direct threats to human survival.

Climate Change Education is defined as an educational process that aims to integrate climate change knowledge into school curricula, promoting a holistic understanding of the causes, impacts, and solutions to this global crisis. As Fletcher (2023) and UNESCO (2021a) suggest, EduClima is not limited to the transmission of facts, but engages students in learning that fosters critical, civic, and problematic skills needed to transform society.

The importance of EduClima transcends mere awareness. According to March (2024), it is key to preparing young people to make informed decisions and actively participate in climate change mitigation and adaptation. The evidence is clear: without robust climate education, young people remain vulnerable to the impacts of climate change and less equipped to contribute to a sustainable society.

Several countries have already recognized the importance of EduClima and incorporated it into their education systems. Italy, since 2020/21, has made the topic of climate change and sustainable development mandatory, all schools have started teaching about climate change and sustainable development in at least 33 hours per school year (BBC, 2019). This program aims not only to inform but also to inspire students to become active agents in the fight against climate change. Another example is the Foundation for Environmental Education's "Eco-Schools" program, which operates in 68 countries and reaches millions of students. This program encourages schools to adopt sustainable practices and involve students in environmental action projects (FEE, 2020). The Australian organization Cool Australia, for its part, offers free educational resources on sustainability and climate change for teachers and students, integrating climate topics into various school subjects, with activities, lesson plans, and worksheets to be used in primary or secondary schools (Cool, 2024).

In the Republic of Korea, since 2007, the national curriculum includes climate education at all levels. In preschool, 4-year-olds explore the weather, and at age 5, they learn about weather patterns. This is supported by the Law for the Promotion of Environmental Education, aiming at sustainable development (UNESCO, 2021a). France announced that it would start including lessons on climate change at the start of the 2020/21 school year. In 2020, New Zealand integrated climate change studies into the secondary school curriculum. Cambodia, Argentina, Mexico, and the United Kingdom have also initiated preliminary actions to broaden their curricula by incorporating themes related to climate change (March, 2024).

The UK has taken an ambitious approach through the "Sustainability and Climate Change Strategy" launched in 2022 by the Department for Education (DfE, 2022). This strategy aims to position the UK's education sector as a world leader in sustainability and climate change education by 2030. The strategy ranges from formal education to extracurricular experiences, encompassing the management of school buildings and their surroundings, with the aim of improving the environment and inspiring the local community (DfE, 2023).

These examples highlight the vital role that education systems can play in promoting a deep understanding of sustainability and climate change.

Despite these advances, the integration of climate change education faces significant challenges. As reported by UNESCO (2021b), almost half of the national curricula analysed do not mention climate change, and a minority of teachers feel confident to teach on the topic. This scenario is exacerbated by the direct impacts of climate change on education, such as schools closed due to natural disasters, as highlighted by Venegas Marin et al. (2024) and Nusche et al. (2024).

In response, UNESCO (2024) commits to implementing national education strategies to address climate risk and build more resilient education systems. The World Bank document cited by Venegas Marin et al. (2024) also suggests concrete measures, such as resilience education management and climate-adapted school infrastructure, to protect education systems from climate impacts.

Climate education is based on several fundamental principles and objectives that aim to increase public understanding of climate change and its implications. Among the main foundations are scientific knowledge, awareness and sensitization, practical skills, and empowerment and engagement. Climate education should provide a sound understanding of the scientific underpinnings of climate change, including the causes, effects, and solutions. According to UNESCO, climate education should be based on robust and up-to-date scientific data (UNESCO, 2020). In addition to theoretical knowledge, climate education should equip individuals with practical skills to adopt sustainable behaviors and contribute to climate change mitigation and adaptation.

Climate change education is more than a curricular component; It is an urgent need and a crucial tool for survival and sustainable development. Municipalities and states must urgently implement climate change education, especially in the regions most affected by extreme events, as recently occurred in Rio Grande do Sul and in municipalities such as Teresópolis and Nova Friburgo in Rio de Janeiro, or São Sebastião in São Paulo. It borders on irresponsibility not to discuss the problem with young people in schools, leaving them at the mercy of false information that is not based on scientific knowledge about extreme events.

Curricular changes are essential, as well as intensifying access to websites that explain global warming and climate change from a scientific point of view. Not only nations must get involved, but especially local authorities, where tragedies caused by climate change occur. Municipalities can and should include climate change education in school curricula, train teachers of all subjects to be open to discussing the problem, and encourage young people to take action. Nations must act swiftly and decisively to integrate EduClima into all levels of education, empowering young people to be proactive agents of change in the fight against climate change. As the climate crisis respects no borders, the education response must also be global, with shared policies, resources, and strategies that transcend national borders to prepare a truly resilient and empowered generation.

According to the United Nations Development Programme (UNDP), it is indisputable that education is a fundamental tool. Policymakers must continue to educate all generations not only on what climate change is and its effects but, even more importantly, on protection and mitigation measures. Integrating climate-focused education, from primary to tertiary education, will be essential to create awareness and embed climate solutions at all levels of society. Empowering young people offers a historic, transformational, and collective opportunity to promote an inclusive green recovery, accelerate progress on the SDGs, and lay the foundation for a peaceful and sustainable future (Modéer, & Otieno, 2022)

To address the challenges of implementing climate education, it is necessary to adopt diverse practices and approaches adapted to different educational and cultural contexts. Curriculum integration, for example, is an approach that ensures that all students acquire knowledge about climate change from an early age. UNESCO suggests that integrating climate education into all school subjects is essential to achieve a holistic understanding (UNESCO, 2020). Engaging students in hands-on projects related to climate change can make learning more meaningful and applicable. School gardening projects, air quality monitoring, and waste reduction initiatives are all effective examples.

The phenomenon of climate change has become a global challenge that affects human activities in many ways. Exploring the sustainability and innovation of digital education is an important benchmark for the continued implementation of scientific and educational strategies and

for positive effects on climate change mitigation. Digital tools can facilitate collaborative learning and scientific research. (Zhao et al, 2023). Collaborating with environmental organizations, universities, and local communities can enrich climate education by providing diverse learning experiences and additional resources. Collaboration can include lectures by experts, visits to research centers, and participation in community events.

Beyond the school environment, climate education must extend to the community. Community education programs, workshops, and awareness campaigns can reach a wider and more diverse audience. Young people and children are among the most affected by climate change, not only in terms of physical and emotional health, but also in terms of access to education. March (2024) points out that extreme weather events, such as floods and heatwaves, significantly limit access to education, perpetuating a cycle of vulnerability and poverty. UNICEF points out that billions of children live in countries with high climate risk, many of whom could lose access to education due to climate-induced disasters (March, 2024).

The importance of climate education in preparing young people cannot be underestimated. According to UNESCO (2020), it should be transformative, empowering students to understand climate science, recognize the urgency of the crisis, and take effective action. Climate education not only informs, but also inspires concrete actions, promoting active and conscious citizenship. UNESCO's "Education for Sustainable Development Goals: Learning Objectives" study (2017) highlights that climate education should include theoretical and practical knowledge, critical and civic skills, and attitudes and values that promote sustainability. Integrating these dimensions into teaching prepares students to be leaders and innovators in building a sustainable future.

Climate education not only prepares young people to address environmental challenges but also catalyzes youth activism, which has proven to be a powerful force in the fight against climate change. Young people who are well-informed and educated about climate issues are more likely to be actively involved in social movements and lead initiatives for change. Youth activism, exemplified by figures such as Greta Thunberg and Txai Suruí, demonstrates the significant impact young people can have on public awareness and pressure for effective environmental policies. Movements such as Fridays for Future and the work of Indigenous activists show how climate education can inspire concrete action and global mobilizations. Thus, the link between education and activism is vital, as a strong educational foundation empowers young people to become leaders in the fight for climate justice and environmental sustainability.

Despite advances, the implementation of climate education faces significant challenges. A 2021 UNESCO report revealed that almost half of national curricula do not mention climate change, and many teachers do not feel prepared to teach on the topic (UNESCO, 2021a). Lack of resources, inadequate teacher training, and institutional resistance are common barriers. In addition, extreme

weather events often disrupt education. Schools closed due to natural disasters, such as floods and hurricanes, hinder continuity of learning and exacerbate educational inequalities (UNICEF, 2021). School infrastructure must be adapted to withstand climate impacts, ensuring the safety and continuity of education.

For climate education to be effective, it is essential that governments, educational institutions and communities work together. Public policies should support the inclusion of climate education in curricula, provide continuous training for teachers, and ensure adequate resources. In addition, it is vital to engage students in hands-on projects and climate action initiatives, connecting theoretical learning with actual practice. The United Nations Development Programme (UNDP) supports "adaptation initiatives that improve the resilience of vulnerable communities" (UNDP, 2024).

In short, climate education is a powerful tool to empower young people to tackle the climate crisis. Integrating it into school curricula and overcoming implementation challenges are crucial steps to ensure that future generations are prepared to promote sustainability and resilience in their communities. Implementing effective and adaptive practices in educational and community contexts is essential to prepare future generations to address climate challenges in an informed and proactive manner.

ROLE OF YOUTH ACTIVISM IN THE FIGHT AGAINST CLIMATE CHANGE

Youth activism has emerged as a potent and transformative force in the fight against climate change. Young people around the world have been mobilizing to demand immediate and effective climate action, bringing new perspectives and renewed urgency to the public debate. The role of these young activists is vital, as they not only push for policy change, but also raise awareness and engage communities in climate action. Youth activism has a significant impact on various aspects of the fight against climate change, including global mobilization, narrative shifting, political influence, and innovation in creative solutions.

Youth activism and climate education are intrinsically linked. Young people who are well-informed about climate issues are more likely to become activists. Climate education provides the knowledge needed to understand the science of climate change and the skills to advocate for sustainable policies. Educational programs that incorporate climate action projects encourage students to apply what they learn in the classroom to practical initiatives.

Youth activism against climate change has gained international prominence with Greta Thunberg's initiative. In August 2018, Greta, then 15, started a school strike in front of the Swedish parliament, protesting the government's inaction in the face of the climate crisis. Their individual action quickly turned into the global "Fridays for Future" movement, which mobilized millions of young people in more than 150 countries. The young Swedish activist has become a worldwide

symbol of the fight against climate change. His hard-hitting speech at the United Nations in 2019 and his participation in several international conferences galvanized the youth movement and drew global attention to the climate crisis. She stated, "I want you to act like our house is on fire. Because it is" (Thunberg, 2019). This movement has inspired a new generation of activists, demonstrating the power of individual and collective action. Young people have started to use social media and other digital platforms to organize protests, awareness campaigns and petitions, significantly increasing visibility and pressure on decision-makers.

In addition to Greta Thunberg, other young activists have played crucial roles in the climate fight. Vanessa Nakate, a young activist from Uganda, in 2019, became the first Fridays for Future protester in Uganda, awakening to her personal power and developing an influential political voice, in addition to founding the "Rise Up Movement" movement and has worked tirelessly to highlight the disproportionate impacts of climate change in Africa (Nakate, 2020). Her work has brought global attention to the need for climate justice and support for the most vulnerable communities. How a young Ugandan realized that her community was disproportionately suffering from the consequences of the climate crisis. In addition, she notes that activists from African nations and the global south are not heard in the same way as activists from predominantly white nations. Their mere presence exposes the deep inequalities and racism within the climate justice movement. In January 2020, during her attendance at the World Economic Forum in Davos, Switzerland, as one of five international delegates, the Associated Press cut Nakate out of a photo, which showed the other four activists, all white. This incident highlighted Nakate's ongoing call for environmental and social justice for those who have been excluded from climate discussions and who now demand to be heard (Nakate, 2020).

Another striking example of youth activism is that of Txai Suruí, a young Brazilian indigenous woman who highlighted the importance of environmental protection and indigenous rights in international forums. Txai was the only Brazilian to speak at the opening of the 26th Climate Conference (COP26), in Glasgow, in 2021 (G1, 2021). In her speech, she highlighted the problems faced by indigenous peoples in the Amazon, including illegal mining and the destruction of their lands. An excerpt from Txai's speech at COP26 makes a strong call for action on climate change, saying: "We must listen to the stars, the moon, the wind, the animals and the trees. Today the climate is warming, animals are disappearing, rivers are dying, our crops don't flourish like they used to. The Earth is talking, it tells us that we don't have time anymore" (G1, 2021). Txai emphasized the need for urgent action to curb climate change and the importance of indigenous peoples' participation in climate decisions, given their crucial role in protecting forests (Cruz, 2023).

The movement led by Txai Suruí also reflects an intersection between environmental activism and human rights advocacy. From a very young age, Txai followed her parents' struggle for the

protection of their lands in Rondônia and, in 2020, founded the Rondônia Indigenous Youth Movement, which has more than 1.7 thousand members (Unicef, 2023). Her work highlights the importance of climate justice not only as an environmental issue but also as a human rights issue, emphasizing the need to protect vulnerable communities who are on the frontlines of climate change.

In Uruguay, the Youth Network for Climate Justice is the result of a joint effort between young activists and Acción Clima Joven, with the support of UNICEF. This initiative seeks to support and empower the next generation of climate leaders by expanding and strengthening the representation and influence of young Uruguayans in national climate and environmental policy. The first significant milestone in his mission took place during the national meeting of Uruguay's Ministry of the Environment. At that meeting, the young activists made their first request, requesting a dedicated workspace for the youth network within the National Climate Change Response System (SNRCC). This request was granted, allowing young people a space and a platform to influence climate-related policymaking. As a result of this initiative, in 2022, Uruguay decided to create a space for youth representation within the SNRCC, reinforcing the country's commitment to the inclusion of young people in discussions and decisions on climate change (UNICEF, 2024).

In the United States, on June 1, 2022, 13 young people in Hawaii filed a lawsuit, called Navahine F. v. Hawaii Department of Transportation, against the Hawaii Department of Transportation (HDOT) and the state of Hawaii. They allege that the transportation system operated by HDOT generates high levels of greenhouse gas (GHG) emissions, violating their constitutional rights and causing significant harm. These young people claim that these emissions affect their ability to "live healthy lives in Hawaii, now and in the future." They want to ensure that HDOT meets the goal set by the state legislature to decarbonize Hawaii's economy and achieve zero emissions by 2045 (Our Children's Trust, 2024)

Another example of the influence of youth activism is the landmark trial in the state of Montana, in the United States, where young activists sued the state government for failing to consider the impacts of climate change in its decisions about fossil fuels. In August 2023, the court ruled in favor of the youth, highlighting the constitutional right to a healthy environment and setting an important precedent for future legal action. The ruling means that Montana, a major coal and gas-producing state that gets one-third of its energy from burning coal, must consider climate change when deciding whether to approve or renovate fossil fuel projects (Gelles & Baker, 2023).

Most recently, on December 10, 2023, 18 California children, ages 8-17, filed a lawsuit called Genesis B. v. United States Environmental Protection Agency against the United States Environmental Protection Agency (EPA) and the United States federal government. These children claim that the EPA allows the emission of potentially fatal climate pollution from the fossil fuel sources it regulates, harming their health and well-being. They also allege that the EPA discriminates

against them by disregarding the economic value of their lives and futures when deciding on the amount of climate pollution allowed (Our Children's Trust, 2024).

Several movements and prominent figures have been instrumental in advancing youth activism against climate change. Started by Greta Thunberg in 2018, Fridays for Future is a global school climate mobilization movement. Millions of students around the world have been taking part in strikes and protests, demanding climate action from their governments. The Fridays for future youth movement has as its central platform the keeping of global temperature rise below 1.5°C above pre-industrial levels, emphasizing the importance of climate justice and equity for all. The move highlights the need to listen to the available science, creating a safe path to keep global warming below this critical threshold. Committed to the principles of the Paris Agreement, Fridays for Future seeks a union based on scientific evidence and advocates for an end to investments in fossil fuels, promoting a transition to more sustainable and equitable energy sources. (Fridays for Future, 2019).

In the United States, the Sunrise Movement is a youth-led movement advocating for a Green New Deal and ambitious policies to combat climate change. They have carried out direct actions, media campaigns, and political lobbying to promote their causes. Founded in 2017, it bills itself as the climate revolution, aiming to force the government to end the era of fossil fuel elites. The movement's platform includes investments in Black, brown, and working-class communities, and the creation of millions of good union jobs. Emphasizing the need to put ordinary people in charge, the Sunrise Movement aims to build a world that works for everyone, now and in the future. Acknowledging the intensification of climate change, the movement denounces the responsibility of fossil fuel executives and politicians for decades of neglect. They emphasize that they are fighting for what science demands. Confronting the situation, they call for the struggle for power to prevent a climate catastrophe, highlighting that if nothing is done, by 2050, billions of people could become displaced, with natural disasters and food crises becoming more and more frequent. The transition to a new world must be led by young people of all races and classes, mobilizing to elect Green New Deal advocates and push for effective climate policies. (Sunrise Movement, 2021).

Founded by young activists, Zero Hour is an international movement that organizes marches, campaigns, and actions to demand climate justice. Created in 2017 in the United States, it seeks to center the voices of diverse young people in the fight for climate and environmental justice. This youth-led movement provides entry points, training, and resources for new activists and organizers, as well as supporting adults who share this vision. Zero Hour's mission is to organize an unstoppable movement of young people who protect the rights of all and ensure a clean, safe, and healthy environment for a prosperous future. The movement's guiding principles emphasize that those on the frontlines of climate change, including the Global South, People of Color, Indigenous Peoples, Youth, People with Disabilities, Poor People, Women, Queer and Trans People, and People of

marginalized faiths, must lead the fight. Youth leadership is considered transformative and visionary, essential to displacing culture from the oppressive systems of capitalism, colonialism, racism, and patriarchy. The movement advocates building an intersectional alliance to achieve collective liberation and pressure elected officials to enact policies that protect the future of the planet (Zero Hour, 2019).

These cases of youth activism demonstrate a growing movement of young people engaged in the fight against climate change and defending their rights to a healthy future. These cases show that young people have a voice and power to influence public policy, promote awareness of climate issues, and highlight the importance of intergenerational justice. The legal victories set precedents that could influence future actions in other states and countries, strengthening the global movement for climate justice and demonstrating that younger generations are becoming active leaders in the fight for a sustainable future.

The impact of youth activism has been significant on several fronts. School strikes and protests organized by movements such as Fridays for future have put pressure on governments and international institutions to recognize the urgency of the climate crisis and take more ambitious action. In response to the demands of young people, the European Union launched the European Green Deal in 2019, a comprehensive plan to make Europe the first carbon-neutral continent by 2050, its implementation of which has decisive support from young people across Europe (European Youth Forum, 2020). In addition to political changes, youth activism has also influenced public opinion. The visibility of the protests and campaigns on traditional and social media has raised awareness of climate change and its implications, encouraging more people to get involved in the cause.

While youth activism has achieved many successes, it also faces significant challenges. Political resistance, lack of resources, and inequality of access are common barriers. Young activists often face resistance from established political and economic institutions that have a vested interest in maintaining the status quo. Not all young people have equal access to resources and platforms to make their voices heard, especially in disadvantaged regions. In addition, climate anxiety and the burden of fighting a global crisis can take a toll on the mental health of young activists. However, these barriers also present opportunities to strengthen the movement.

Investing in climate education and youth empowerment can further increase the impact of youth activism. International collaboration and the exchange of knowledge and strategies are essential to strengthen the movement. Collaborations between youth activists, NGOs, educational institutions, and governments can create powerful synergies to address the climate crisis. Promoting diversity and inclusion within the climate movement can ensure that all voices are heard and that equitable solutions are developed.

The importance of youth engagement in the fight against climate change is crucial for several reasons. Young people have a vital interest in the future of the planet, as they will be the ones who face the worst impacts of climate change. Its long-term perspective encourages bolder and more ambitious action. According to the World Economic Forum (Dajana & Shujat, 2023), young people are becoming agents of change in the face of the enormous challenges of climate change. Their continued dedication and creative strategies are influencing effective actions and raising global awareness. They highlight the gravity of the situation through climate strikes, public demonstrations, awareness campaigns, and artistic expressions. These young people interact with decision-makers, raising public awareness and inspiring governments and communities to take action. Their enthusiasm, commitment and innovative ideas are an inspiration and remind everyone that it is possible to make a difference in the fight against climate change.

UNDP's People's Climate Vote, the largest public opinion survey on climate change, involving 1.2 million people from 50 countries, revealed that nearly 70 per cent of under-18s are most likely to believe that climate change is a global emergency (UNDP & University of Oxford, 2021). Reality has shown that youth bring energy, passion and creativity to the climate movement. They are quick to adopt new technologies and approaches, utilizing them for mobilization and advocacy effectively.

Young people are adept at social media and other digital platforms, which are powerful tools for organizing and amplifying their voices. This allows your messages to reach a global audience quickly and efficiently. The integration of digital technologies in education is an effective tool against climate change. Digital platforms reduce the carbon footprint of traditional methods by decreasing the use of paper and improving distance learning, facilitating the exchange of knowledge. Educating students about water conservation, energy consumption, and sustainability is crucial. To maximize the impact of climate education, it is vital to empower educators in the effective use of digital resources (Alphonso, 2024). Pressure from young activists has forced political and business leaders to reconsider their positions and adopt more sustainable policies. The voice of young people has become an important catalyst for climate action.

In summary, youth activism is a vital force in the global climate response. Young activists like Greta Thunberg, Vanessa Nakate, and Txai Suruí not only push for political change, but also inspire and mobilize their communities. The synergy between climate education and youth activism is crucial to prepare a generation that is empowered and engaged in the struggle for a sustainable future. Through global mobilization, narrative shifting, political influence, and innovation, young people have demonstrated their power and potential to drive meaningful climate action. Supporting and amplifying young people's voices is essential to ensuring a sustainable and just future for all generations.

THE SYNERGY BETWEEN CLIMATE EDUCATION AND YOUTH ACTIVISM

The synergy between climate education and youth activism is one of the most dynamic and impactful aspects in the fight against climate change. When well-informed and educated about environmental issues, young people become more effective agents of change, able to lead initiatives that promote sustainability and push for robust climate policies. Climate education provides young people with the knowledge and skills they need to understand the climate crisis, while youth activism channels this understanding into concrete and meaningful actions. Together, these forces create a virtuous cycle of awareness and action that can significantly influence the global response to climate change.

Climate education provides a solid foundation of scientific knowledge about the causes, effects, and solutions to climate change. By understanding the scientific evidence, young people are empowered to make informed decisions and critique policies and practices that contribute to environmental degradation. According to UNESCO, "quality climate change education can transform the understanding and behaviour of individuals" (UNESCO, 2021c). In addition, climate education develops essential skills such as critical thinking, problem-solving, and effective communication. These skills are crucial for activism, as they allow young people to analyze complex problems, formulate strategies for action, and communicate their messages in a persuasive manner.

Climate education also sensitizes young people about the seriousness of the climate crisis and empowers them to take action. By feeling informed and prepared, young people become more confident to lead movements and campaigns. Through climate education, young people learn about the mechanisms of civic participation and how to influence public policy. This is essential for activism, as it allows young people to engage in democratic processes and push for legislative and regulatory change.

Several projects around the world illustrate the synergy between climate education and youth activism. The "Fridays for Future" project is an example already commented on, where the awareness acquired in schools about climate change has led to the mobilization of millions of young people in school strikes and global protests. This global movement, started by Greta Thunberg, is a clear example of how climate education can fuel youth activism. The education she and her fellow activists received formed the basis of their activism and their demands for robust climate policies (Fridays for Future, 2019). In Germany, the "Schools for Future" program engages students in local climate action, from conducting energy audits in their schools to organizing community events on sustainability. These projects demonstrate how climate education can inspire and empower young people to become active leaders in their communities, driving real and lasting change (Schools for Future, 2024).

In the United States, the Sunrise Movement combines climate education with activism by conducting trainings and workshops to empower young activists. They provide knowledge about climate science, organizing skills, and advocacy strategies, empowering young people to lead campaigns for the Green New Deal and other policy initiatives (Sunrise Movement, 2021). Programs such as "Youth Climate Leaders" and "Eco-Schools" empower young people through climate action training and projects. These programs not only educate students about environmental issues but also engage them in practical initiatives such as recycling campaigns, community gardens, and renewable energy projects, turning learning into concrete action (Youth Climate Leaders, 2020; Eco-Schools, 2023). The Eco-Schools Program is an international example that integrates environmental education into school curricula and encourages students to implement sustainable projects in their schools and communities. Young participants often become environmental activists, utilizing the knowledge and skills gained to lead local initiatives and influence educational and environmental policies (Eco-Schools, 2023).

The integration of climate education and youth activism results in numerous benefits. First, young people educated about climate issues are better prepared to lead and participate in initiatives that promote sustainability. They have the ability to understand the complexities of climate change, identify viable solutions, and mobilize their communities around those solutions. Research conducted by UNESCO (2021c) indicates that students involved in climate education programmes demonstrate a significant increase in environmental knowledge, positive attitudes towards the environment, and greater engagement in climate action. These results underscore the importance of an integrated approach that combines education and activism to maximize impact in the fight against climate change.

Additionally, climate education promotes the development of core competencies such as critical thinking, problem-solving, and collaboration. These attributes are key to effective activism, as they enable young people to develop innovative and effective strategies to address climate challenges. Climate education not only prepares young people to understand the climate crisis, but also motivates them to take action. This process involves several interconnected steps: awareness and understanding, empowerment and capacity building, and action and mobilization. The first step is to inform young people about climate change, its causes, effects, and possible solutions. Deep understanding of the environmental and social impacts of the climate crisis is crucial to awakening a sense of urgency. Once informed, young people need to feel empowered to take action. This involves providing them with the necessary tools and resources so that they can engage in activist activities. Workshops, training, and access to communication platforms are key. With the knowledge and skills in hand, young people are encouraged to participate in concrete actions, such as organizing protests

and media campaigns, participating in political negotiations, and implementing sustainable projects in their communities.

While the synergy between climate education and youth activism offers many benefits, it also presents challenges. Effective implementation of climate education can be hampered by a lack of resources, inadequate teacher training, and institutional resistance. Schools and educational institutions may face political and economic pressures that make it difficult to implement climate education programs. In addition, young activists often face political and social barriers that limit their ability to influence change. The climate crisis can cause significant anxiety and stress among young people, especially those deeply involved in activism. It is important to provide psychological support and resources to help young people cope with these feelings.

To overcome these challenges, it is essential that governments, educational institutions, and civil society organizations collaborate to promote climate education and support youth activism. Public policies that integrate climate education into national curricula, along with continuing education programs for educators, are critical. Promoting diversity and inclusion within the climate movement can ensure that all voices are heard and that equitable solutions are developed. In addition, it is important to provide platforms and resources that enable young activists to share their experiences and strategies, amplifying their impact globally (UNESCO, 2021a). Adopting innovative approaches, such as project-based learning, the use of digital technologies, and curriculum integration, can make climate education more accessible and effective.

The interconnectedness of climate education and youth activism is essential to addressing the climate crisis. Climate education provides the necessary knowledge and skills base, while youth activism transforms this foundation into concrete and meaningful action. Together, these forces can create a powerful and sustainable movement that not only responds to today's climate challenges but also prepares future generations to protect and preserve our planet. The combination of climate education and youth activism represents a powerful approach to tackling the climate crisis. By empowering young people with the necessary knowledge and skills, and by supporting their advocacy initiatives, it is possible to drive meaningful and lasting change towards a more sustainable and resilient future.

FUTURE CHALLENGES AND OPPORTUNITIES

Integrating climate education and youth activism presents significant challenges, but it also offers numerous opportunities to build a more sustainable and resilient future. Understanding these dynamics is crucial to maximizing positive impact and addressing existing barriers. Climate education is vital to empowering future generations to understand and address the effects of climate

change, while youth activism brings energy and urgency to the actions needed to mitigate and adapt to this crisis.

Human activities such as fossil fuel use, deforestation, and unsustainable agriculture contribute to climate change by reducing the availability of nutritious food and clean water, and destroying ecosystems, resulting in malnutrition, poor health, and migration, especially affecting young people. These, who make up the majority of the population in many countries, have growing social and environmental awareness, and can transform society towards a low-carbon and resilient future. The United Nations recognizes the crucial role of young people in the fight against climate change by collaborating with youth organizations to empower and increase their participation in policy decisions on the topic. Formal and informal education on climate change and sustainable lifestyles should be strengthened, promoting sustainable patterns of production and consumption, and supporting young people as environmental advocates in their communities. Partnerships between governments, intergovernmental organizations, NGOs and youth groups are essential for environmental initiatives that build the capacity of young people as future leaders in the climate fight. Additional efforts are needed to prepare young people to take advantage of new green employment opportunities, which not only offer work but also enable young people to contribute directly to climate change mitigation (UNYouth, 2013).

One of the biggest challenges in implementing climate education is the lack of adequate resources. Many schools around the world face financial constraints that make it difficult to purchase educational materials, train teachers, and develop after-school programs focused on sustainability. Lack of institutional support and consistent public policies impedes the effective integration of climate education into school curricula (UNESCO, 2021). This educational inequality is particularly reflected in disadvantaged regions and marginalized communities, which often lack adequate educational resources, limiting the potential of their young people to engage in climate activism.

In addition, institutional resistance is another significant challenge. In some regions, climate issues are politically sensitive, and educators face pressure to avoid controversial topics. Schools and educational institutions may face political and economic pressures that make it difficult to implement climate education programs. Governments and school administrations may prioritize other areas of the curriculum, neglecting environmental education. This resistance can hinder the adoption of comprehensive educational programs that address climate change in a holistic and scientific manner.

Inadequate teacher training is a critical obstacle. Many educators do not feel prepared to teach about climate change, either because of a lack of specific knowledge or a lack of appropriate teaching resources. Without continuous and specialized training, it is difficult to ensure that students receive a high-quality climate education.

Young activists face a range of challenges when trying to influence policy and mobilize their communities. Lack of access to platforms and financial resources limits young people's ability to organize impactful events, campaigns, and other initiatives. In addition, many young activists face social and cultural barriers, including the devaluation of their voices and contributions by adults and authorities. Political repression is another challenge faced by activists in some parts of the world. In certain contexts, protests and other forms of activism are seen as threats to stability and public order, resulting in legal restrictions and, in some cases, reprisals against activists (Gayle, Taylor, & Niranjan, 2023)

Despite these challenges, there are many opportunities to expand and strengthen climate education. One such opportunity is the growing global awareness of the importance of education for sustainable development. International organizations, such as UNESCO and UNDP, have promoted initiatives that encourage the inclusion of climate education in national curricula and offer technical and financial support for its implementation (UNESCO, 2021).

Technology also offers new possibilities for climate education. Online platforms, digital resources, and interactive tools can complement traditional teaching and make learning about climate change more accessible and engaging. Programs such as "NASA Climate Kids" provide high-quality educational resources that can be used by teachers and students around the world (NASA, 2024).

Youth activism is also filled with opportunities for growth and impact. Collaboration between youth organizations and environmental NGOs can amplify the voice of young people and provide the resources needed for their campaigns. Additionally, the intersection of activism and technology allows young people to reach global audiences through social media and other digital platforms, increasing the visibility of their causes (Youth Climate Leaders, 2024). Schools and universities can also play a crucial role in supporting youth activism. Educational institutions can provide safe spaces for discussions, capacity-building workshops, and awareness-raising events, as well as encourage student participation in community projects and climate action initiatives. Integrating environmental clubs and student councils focused on sustainability can foster a culture of activism within educational institutions.

To overcome challenges and seize opportunities, various strategies can be implemented. Developing and implementing public policies that encourage climate education and protect the rights of young activists is essential. This includes allocating financial resources to schools and educational programs, as well as creating safe legal environments for activism. Investing in continuing education programs for educators, enabling them to teach about climate change effectively, is equally important. Workshops, online courses, and certification programs can help teachers gain the necessary knowledge and skills.

Establishing partnerships between governments, NGOs, educational institutions, and youth organizations to promote joint climate education and activism initiatives can provide resources, visibility, and logistical support for impact projects. Harnessing digital technologies to disseminate knowledge about climate change and support activism initiatives is another effective strategy. Online platforms, educational apps, and social media can be powerful tools for engaging and mobilizing young people. According to Alphonso (2024), to maximize the impact of climate education, it is vital to train educators in the effective use of digital resources.

Encouraging the active participation of local communities in climate education and activism projects is also crucial. This can include organizing community events, volunteer programs, and awareness campaigns that involve citizens of all ages. Another problem that occurs among young people is climate anxiety. According to research reported by Novotney (2023), conducted by the American Psychological Association in 2020, it identified that almost half of young adults aged 18 to 34 said they felt stress due to climate change in their daily lives. According to the author, the feeling of climate anxiety occurs with a sense of fear, sadness, and dread in the face of global warming or anxiety and worry related to climate change and its effects (Novotney, 2023).

Creating supportive communities among young activists can provide an environment of solidarity and encouragement, helping them navigate the emotional challenges associated with climate activism. Implementing psychological support and well-being programmes in schools and communities can help young people cope with climate anxiety by strengthening their resilience and capacity for action.

The challenges and opportunities in the interconnection between climate education and youth activism are numerous and complex. Overcoming the challenges requires a coordinated and collaborative effort between governments, educational institutions, non-governmental organizations, and communities. Seizing opportunities involves innovation, strategic partnerships, and strong support for the mental health of young activists. Together, these efforts can strengthen young people's ability to lead the fight against climate change, promoting a more sustainable and equitable future for all.

In conclusion, climate education and youth activism are crucial components in the global response to climate change. While there are significant challenges, the opportunities to promote effective climate education and support youth activism are vast. With the right strategies and collaboration between diverse stakeholders, it is possible to build a strong and cohesive movement that empowers future generations to tackle the climate crisis with knowledge, resilience, and determination.

CONCLUSION

The climate crisis represents one of the most urgent challenges of our time, requiring a multifaceted approach that involves education, youth activism, and effective public policy. The synergy between climate education and youth activism forms a powerful combination to address this crisis, empowering future generations to understand, mitigate, and adapt to the impacts of climate change. Climate education is key to providing young people with the knowledge and skills they need to become agents of change. Robust educational programs that integrate climate science into school curricula are essential to prepare students for the environmental challenges of the future. Continuous teacher training and the availability of high-quality educational resources are also essential for the success of these initiatives.

In parallel, youth activism has proven to be a significant force in promoting political and social change. Young activists, such as Greta Thunberg, Vanessa Nakate and Txai Suruí, have mobilized millions of people around the world, pressuring governments and institutions to adopt more ambitious climate policies. Global movements such as Fridays for Future and Sunrise Movement demonstrate how climate education can fuel youth activism, inspiring millions of young people to demand policy change and adopt sustainable practices. These examples highlight the power of youth narratives in influencing public opinion and pushing for more ambitious climate action.

However, effectively implementing climate education and supporting youth activism face several challenges. Inequality of access to quality climate education is a critical problem, especially in disadvantaged regions and marginalized communities that often lack adequate educational resources. The lack of financial and material resources in schools impedes the acquisition of educational materials, the training of teachers, and the development of extracurricular programs aimed at sustainability. In addition, institutional resistance and political and social barriers constitute significant obstacles. In some regions, climate issues are politically sensitive, and educators face pressure to avoid controversial topics. Political repression is also a challenge faced by activists in some parts of the world, where protests and other forms of activism are seen as threats to stability and public order, resulting in legal restrictions and, in some cases, reprisals against activists.

One of the problems that must be considered is inadequate teacher training, constituting a critical obstacle in climate education. Many educators do not feel prepared to teach about climate change, either because of a lack of specific knowledge or a lack of appropriate teaching resources. Without continuous and specialized training, it is difficult to ensure that students receive a high-quality climate education. Additionally, the climate crisis can cause significant anxiety and stress among young people, especially those deeply involved in activism.

Despite these challenges, the opportunities to expand and strengthen climate education are significant. Growing global awareness of the importance of sustainability, combined with the power

of digital technologies and community support networks, provides fertile ground for high-impact initiatives. International organizations, such as UNESCO and UNDP, have promoted initiatives that encourage the inclusion of climate education in national curricula and offer technical and financial support for its implementation. Technology offers new possibilities for climate education. Online platforms, digital resources, and interactive tools can complement traditional teaching and make learning about climate change more accessible and engaging. Free online programs provide high-quality educational resources that can be utilized by teachers and students around the world.

Youth activism is also filled with opportunities for growth and impact. Collaboration between youth organizations and environmental NGOs can amplify the voice of young people and provide the necessary resources for their campaigns. The intersection of activism and technology allows young people to reach global audiences through social media and other digital platforms, increasing the visibility of their movement. Schools and universities can play a key role in supporting youth activism by providing safe spaces for discussions, capacity-building workshops, and awareness-raising events, as well as encouraging student participation in community projects and climate action initiatives. The integration of environmental NGOs and student councils focused on sustainability can foster a culture of activism within educational institutions.

To overcome challenges and seize opportunities, various strategies can be implemented. Developing and implementing public policies that encourage climate education and protect the rights of young activists is essential. This includes allocating financial resources to schools and educational programs, as well as creating safe environments for activism. Investing in continuing education programs for educators, enabling them to teach about climate change effectively, is equally important. Workshops, online courses, and training programs can help teachers gain the necessary knowledge and skills.

Establishing partnerships between governments, NGOs, educational institutions, and youth organizations to promote joint climate education and activism initiatives can provide resources, visibility, and logistical support for impact projects. Harnessing digital technologies to disseminate knowledge about climate change and support activism initiatives is another effective strategy. Online platforms, educational apps, and social media can be powerful tools for engaging and mobilizing young people. Encouraging the active participation of local communities in climate education and activism projects is also crucial. This can include organizing community events, volunteer programs, and awareness campaigns that involve citizens of all ages. Creating supportive communities among young activists can provide an environment of solidarity and encouragement, helping them navigate the emotional challenges associated with climate activism.

In conclusion, the interconnection between climate education and youth activism not only responds to today's climate challenges, but also prepares future generations to protect and preserve

the planet. Climate education and youth activism are essential components in the fight against climate change. Together, they can build a more sustainable and resilient future, ensuring that the next generations are well-prepared to address environmental challenges and promote a fairer and more balanced world. With the right strategies and collaboration between diverse stakeholders, it is possible to build a strong and cohesive movement that empowers future generations to tackle the climate crisis with knowledge, resilience, and determination.

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Naturally occurring radioactive material: A modeled approach for professional education courses in radiology

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ABSTRACT

Natural radioactivity is a characteristic present in several materials in the Earth's crust, known as Naturally Occurring Radioactive Materials (NORM). These materials include minerals such as uraninite, which contains uranium and other radioactive elements, and are widely distributed in nature. With the advancement of industrial exploration, especially in mining and oil and gas extraction, Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) emerge, which result from industrial processes that increase their concentration or radioactive activity. This study aims to analyze the presence and management of these materials, highlighting their importance in radiological and environmental safety. Proper management of NORM and TENORM is essential to prevent risks to human health and the environment. Uraninite, for example, is a significant source of uranium used in nuclear energy production, a process that transforms NORM into TENORM through activities such as mining and processing. The literature review carried out in this study highlights the diversity of sources and forms of NORM and TENORM around the world, evidencing its presence in various industrial sectors such as metal mining, oil extraction, fertilizer production and civil construction. Each sector presents specific challenges for the management and safe disposal of these materials, requiring the rigorous application of regulatory standards and radiological protection techniques. Professionals in the field of radiology play a fundamental role in the application of these standards, ensuring the safety of workers and the general population in the face of exposure to NORM and TENORM. The dissemination of knowledge about these materials is crucial to train professionals and students in the safe and effective handling of these substances, ensuring that industrial practices are conducted with environmental responsibility and adequate radiological protection. In summary, the study emphasizes the importance of understanding and applying the concepts of NORM and TENORM in modern industry, highlighting the challenges and best practices for the management of these materials, aiming to protect human health and preserve the environment.

Keywords: NORM, TENORM, Professional education.

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INTRODUCTION

With the advent of radioactivity in 1896 by the couple of scientists Pierre and Marie Curie together with Antoine Henri Becquerel, the radioactive properties of certain natural atomic elements were discovered (MARTINS, 1990). However, it is observed that these radioactive elements are not found in their pure or concentrated form in nature. On the contrary, its occurrences demonstrate a much lower activity than those measured when radioactive material is extracted and/or purified, and may present risks if proper precautions are not taken (LINCE, 2024). Radioactive elements are present in water, air, soil, that is, everywhere in the earth's crust and its atmosphere. Due to their natural occurrence, such elements have not presented risks to human health, but with the increase in mining and oil and gas exploration, their risks become more of a concern.

OBJECTIVE

To expose concepts about common naturally occurring radioactive materials (NORM) and technologically improved radioactive materials (TENORM), showing how companies live with them on a daily basis, as well as the importance of this knowledge being disseminated to the community of professionals of radiological techniques.

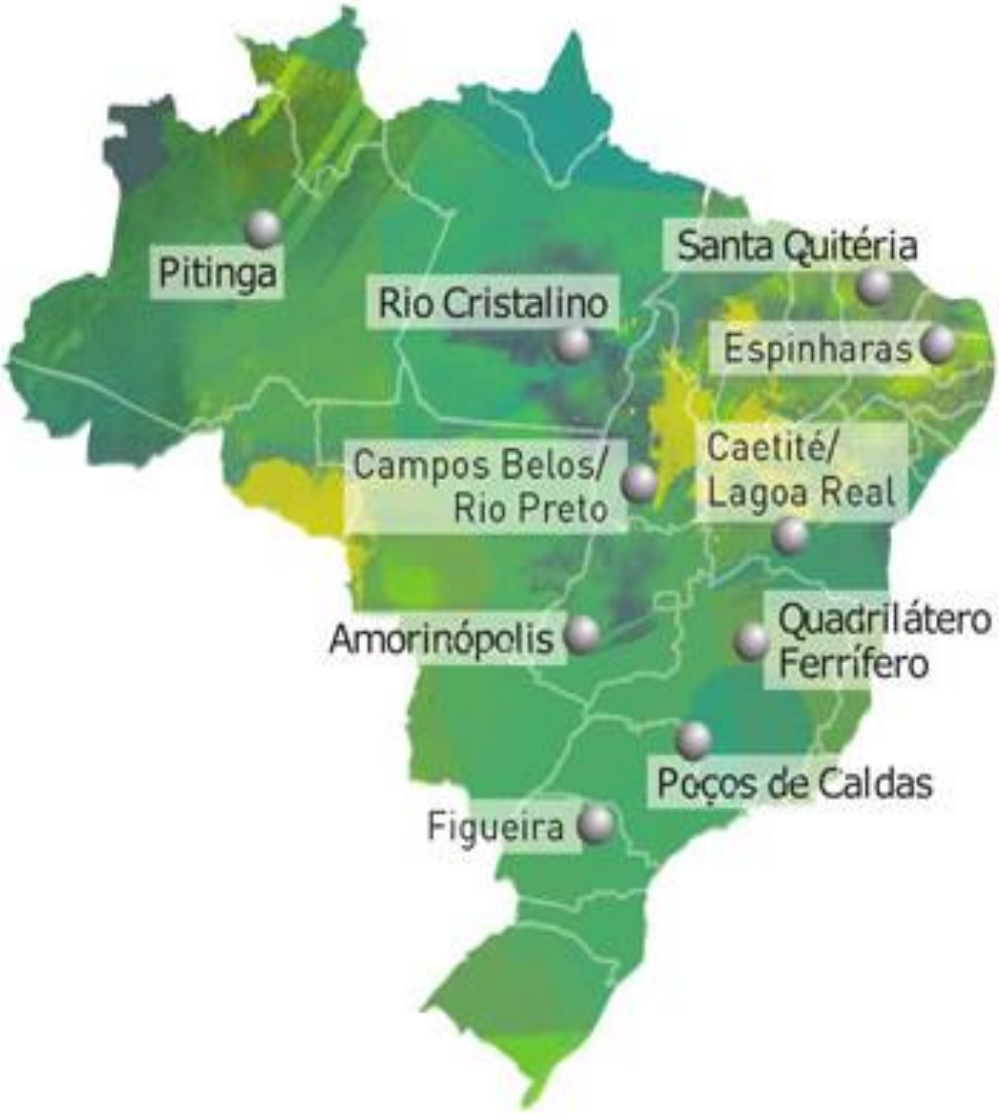
METHODOLOGY

A bibliographic study was carried out to observe the importance and the forms of application of knowledge about NORM and TENORM.

RESULTS

NORM is an acronym for "Naturally Occurring Radioactive Material". These materials are found in nature and are often used by laypeople who are unaware of their radioactive potential (LINCE, 2024). NORMs are natural radioactive materials found through mining, that is, it is any type of primary material in natural radiation; it is the raw material of the soil without alterations, which is extracted linked to other materials such as some types of metals or precious stones depending on its extraction site (DUARTE, 2021). A great example of NORM is the uraninite found on a large scale in Brazil. Uranium can be extracted from uraninite, because uraninite is a radioactive uranium oxide mineral of the oxide class that contains small amounts of radium, thorium, polonium, lead and helium, being a natural radioactive material formed in the soil by volcanic rocks or hydrothermal vents of medium and high temperature or can be found in sedimentary deposits (REI, 2014). According to the International Atomic Energy Agency (IAEA), there are several reservoirs of NORM scattered around the planet. Some of them are found in Brazil, as shown in figure 1, considering that it is the seventh country with the highest reserve of NORM (IAEA, 2018).

Figure 1 - Uranium geological reserves in Brazil.

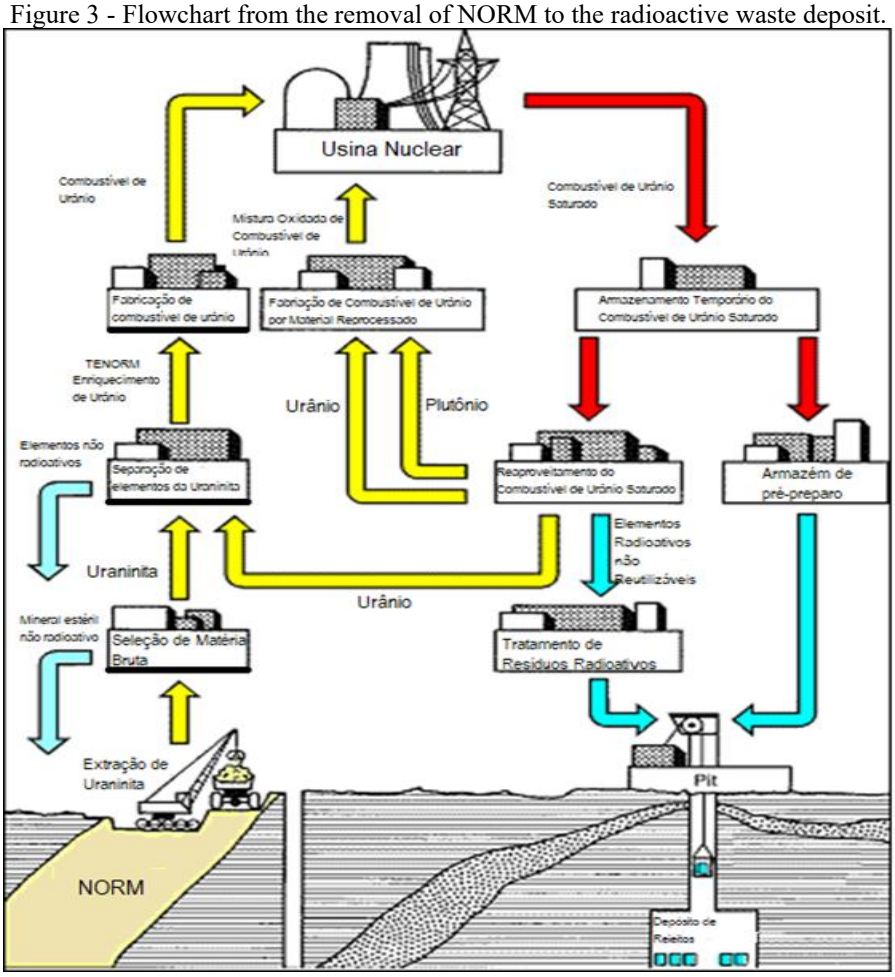


Just as NORM is an acronym, so is TENORM, and stands for "Technologically Enhanced Naturally Occurring Radioactive Materials" (CNEN, 2016). TENORMs are natural radioactive materials that have undergone some kind of modification or enrichment, see figure 2, which means that they have undergone some kind of human intervention. One of the most used in Brazil is the modification of uraninite (NORM) to become uranium (TENORM), through the Uraniferous District of Lagoa Real, located in Serra Geral, Caetité-BA, where its exploration began only in 1998 by Indústrias Nucleares do Brasil - INB (LINCE, 2024).

Figure 2 - Transformation of NORM into TENORM.

Since then, its raw material, uraninite (NORM), has been used in the production of uranium pellets (TENORM) that supply the energy production of the Angra I and Angra II nuclear power plants (REI, 2014). Figure 3 shows NORM that contaminated a water reservoir in Juazeiro, in Caetité, Bahia - a large site of uraninite extraction. Greenpeace collected water and sediment samples in August 2008, the results of which indicated the presence of NORM and TENORM in two natural lagoons in the vicinity of the mine.

Figure 3 - Flowchart from the removal of NORM to the radioactive waste deposit.



The research included a sample of water collected from an artesian well about eight kilometers from the extraction mine, which showed uranium concentrations seven times higher than the maximum limits indicated by the World Health Organization (WHO) (REI, 2014). Another example of TENORM formation is in the pipelines of oil extraction platforms, illustrated in figures 5 and 6.

Figure 5 - Image depicts the transformation of NORM into TENORM on oil and gas platforms.

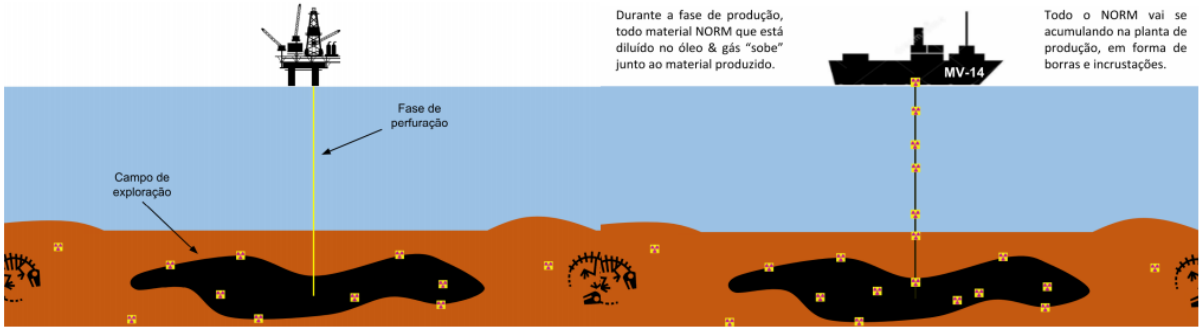
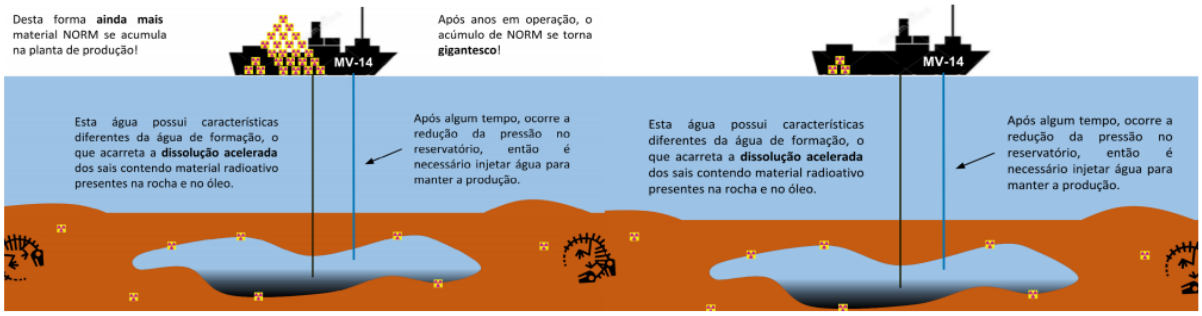


Figure 6 - Image depicts the transformation of NORM into TENORM on oil and gas platforms.



This material has the potential to create radiation fields whose dose values exceed the safe limits established by the National Nuclear Energy Commission (CNEN) for occupationally exposed individuals - 20mSv/year - and, especially, for the general public - 1mSv/year (CNEN, 2016).

The U.S. Environmental Protection Agency (EPA) provides a list of TENORM sources that provides a general insight into the hazards posed by this class of radioactive substances. The main industrial sectors that generate TENORM are: Mining > Gold, silver, zircon and titanium mining waste; Gemstone mining waste; Uranium mining waste; Mining waste and copper production; Residues from bauxite and alumina production. Energy Production > Oil & Gas Production Waste; Coal Combustion Residues. Consumer Products > Fertilizer and Fertilizer Residues; Cigarettes; Building materials; Granite countertops (EPA, 2008).

Many of the materials that are considered TENORM have only traces of radioactivity and are part of our everyday landscape. However, a few dozen TENORM concentrations result in a relatively higher rate of radionuclides that can result in high radiation exposures (EPA, 2008). For the time being, the radioprotection of NORM is treated more specifically by CNEN through standard 4.01, which regulates radioprotection in the mining of materials that may contain radionuclides. Workers' safety should be obtained through frequent training offered by the institution's radiological protection supervisor (SPR), as well as the Radiological Emergency Plan, Physical Protection and Fire Protection Plan, and Occupational Radiological Protection Plan. It is up to CNEN to verify that companies are complying with the provisions of the law (CNEN, 2016). On the international scene, the International Atomic Energy Agency and the European Community have published recommendations on the application of the concepts of exclusion, exemption and exemption for activities with TENORM products. The exclusion applies when it is detected that regulatory control is inapplicable to exposures whose intensity or probability of occurrence is not material, at the discretion of the regulatory body. Exemption, on the other hand, is the regulatory act that exempts a practice or source associated with a practice, from the point of view of radiological protection (DUARTE, 2021). The person who advises the company in relation to the processes is the radiological protection supervisor (SPR), a position occupied by a professional who necessarily qualified to exercise after CNEN qualification exams.

CONCLUSION

Professionals in the field of radiation protection must be able to ensure that all workers, individuals from the public and the environment involved have adequate radiological safety. To this end, it is necessary to be familiar and knowledgeable about the work procedures and inherent safety requirements, which demands scientific dissemination actions in this field of radiological knowledge, to generate professional sedimentation in this area.

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Reading and writing in youth and adult education: Learning difficulties and importance in social development

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ABSTRACT

Youth and Adult Education (EJA) has been standing out, with the purpose of providing access to school for the public that, for some reason, has been excluded, thus allowing them to recover lost time in the field of formal education and in preparation to exercise their rights and duties as citizens. The purpose of this research is to weave some reflections about reading and writing in EJA. Its objectives are to evaluate the importance of reading and writing in the personal and social development of students, as well as to highlight learning difficulties. The relevance of the study is evidenced when, in the role of EJA teacher, at the Municipal School of Elementary Education of Congo-PB, the institution studied, it was possible to observe the difficulties presented in the learning of reading and writing. The methodology used the field research technique, with the use of a questionnaire. 20 of the 55 EJA students were interviewed. It was found that, although they feel difficulty, the students were able to overcome it and learn to read and write, despite their learning limitations. Such learning can help to improve the interpersonal and professional relationships of these citizens, collaborating with their social development.

Keywords: Reading and writing, Apprenticeship, EJA.

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INTRODUCTION

Youth and Adult Education (EJA) is aimed at individuals who, for some reason, had to interrupt their studies as a child, for reasons such as: work, teenage pregnancy or even those students considered problematic (rebellious); with consistent school dropouts, numerous failures, among other aspects that make these people become marginalized by society. Youth and Adult Education arises with the objective of attracting and welcoming this class, providing the recovery of lost time in the educational field and preparing them to exercise their role as citizens during a society taken by technological advances and driven by capitalism. However, it is necessary to reflect on how to work in the teaching-learning process of these individuals, as they bring with them a vast baggage of knowledge acquired throughout their lives.

Article 37 of the Law of Guidelines and Bases-LDB (Law No. 9394/96) states: "The education of young people and adults will be aimed at those who do not have access to or continuity of studies in primary and secondary education at the appropriate age".

According to Freire (1997), it can be considered that teaching is not transferring knowledge, but creating possibilities for its production or construction. Today, many educators recognize that literacy is not just about learning to put letters together to form words. To really teach literacy, it is necessary to introduce young people and adults to the universe of writing, showing them the main types of texts present in our society.

Therefore, it is important to analyze the teaching-learning relationship *versus* reading and writing of the EJA target audience. The present study visualized the dynamics of EJA related to the difficulty of learning to read and write. The object of study was the Municipal School of Elementary Education of Congo-PB, being observed the students of a Youth and Adult Education class.

THE IMPORTANCE OF READING

The subject's first contacts with reading occur before his/her inclusion in the school environment, through the interaction with various reading objects, in different social contexts. However, in many cases, it is the beginning of school life that seals the subject's entry into the universe of reading, through literacy, — which, however, by itself, does not allow the subject to actively insert himself in the different situations in which reading is present (SOARES, 2003).

According to Kleiman (2005), the school is the most important of the literacy agencies, assuming a prominent role in the reading formation of students. However, this role is historically permeated by social, political, and ideological conflicts. According to Soares (2004), access to the literate world, for the lower classes, in general, is difficult or even impossible, being restricted to literacy, because "[...] the people are allowed to learn to read, they are not allowed to become *readers*" (SOARES, 2004, p. 25).

With the Law of Guidelines and Bases (LDB) 9.394/96, the formation of the subject began to be seen in a more humanistic way. In this law, education is understood as a duty of the family and the State, with the purpose not only of training for work, but also of the full development of the human being and his preparation to exercise citizenship (CARNEIRO, 2009). In this new panorama proposed by the law in force, reading gains centrality and much has been discussed about the importance of the act of reading, about the social function of reading and about the relevance of all areas of knowledge to contemplate and enable reading practices that corroborate the critical formation of students.

Entering the universe of reading implies understanding it as a cultural practice, intrinsically linked to the social relations established in a given space-time. Understood in this way, reading is characterized as a plural, creative, inventive, producing practice, which is not exhausted, nor is it annulled, within the limits of what is read, as if the meaning desired by its author should be inscribed with all immediacy and transparency, without resistance or deviation, in the minds of its readers (BOURDIEU; CHARTIER, 2001).

Being a reader, as can be seen, requires the active participation of the subject in the process of constructing meanings for what is read. The National Curriculum Parameters, in the topic Reading Practice, defend this performance of the reader and guarantee that reading is a process in which the reader performs an active work of constructing the meaning of the text, based on its objectives, its knowledge about the subject, about the author, from everything it knows about the language: characteristics of the gender, of the bearer, of the writing system (BRASIL, 2001).

For Silva (1984), the act of reading is complex and requires the subject's performance in the execution of a series of mental actions, with emphasis on the actions of verifying, comparing and transforming. According to the author, reading begins at the moment when the subject perceives the existence of written documents immersed in the world; Every text maintains relations with the world in which it is inserted, fulfilling an intention. By coming into contact with the text and seeking its intentionality, the subject opens himself to the possibilities of signification, to the propositions of the world that the signs of the document evoke or suggest.

Reading manifests itself, then, as the experience resulting from the path followed by the subject's consciousness in its project of unveiling the text. It is this same experience (or experience of the horizons unveiled through the text) that will allow the emergence of the *reader* (SILVA, 1984).

The realization of a critical reading enables the reader to do much more than appropriate the meaning of the text; it is the driving force for the construction of the subject-reader himself, immersed in his sociocultural reality, helping him in the process of understanding, beyond the written text, the text-world (ALVES; RODRIGUES, 2013).

Learning to read and write thus becomes an opportunity for women and men to realize what it really means to *say the word:* a human behavior that involves action and reflection. To say the word, in a true sense, is the right to express oneself and the world, to create and recreate, to decide, to choose (FREIRE, 1981).

Solé (1998) considers reading as a process of interaction between the subject-reader and the text, which has some implications, among them, the requirement of an active reader, capable of processing and examining what he reads, and the need to set clear objectives, prior to the act of reading, that guide the readings performed.

THE IMPORTANCE OF WRITING

The school proposes a type of teaching, based on a unique model of knowledge. The writing experienced in it does not find its social function and is limited to the correction of errors, causing the marginalized class to find no meaning in school and to have its culture disregarded by the dominant class, by disbelieving in the intellectual capacity of those in situations of poverty (ALVES; RODRIGUES, 2013).

Kleiman (2005) presents the concept of literacy and considers false the belief that the most important aspect for learning to write is the method used. The construction of written language is influenced by several concepts that cannot be seen as mere methodological novelties, often misinterpreted. Literacy corresponds to the situation of people's involvement with the world of writing, of letters, and characterizes the passage of man through the society of letters, of language, his identity transformation and the taking of action in the culturally and historically recorded context.

The complexity of literacy involves multiple capacities to reach the use of writing in society, with an impact on modern life as well. His contributions advance historically, from the perception that it was not enough to write legibly, mastering the written code, it became necessary to attribute meaning to writing in the use of different supports and textual/discursive genres, bringing together an infinity of social situations. In this sense, individual competencies are cooperatively aggregated to achieve objectives in situated practices of writing use, unlike traditional practices that prioritize individual activities decontextualized, even competitively. It is important to highlight that speech corresponds to a language that cannot be disregarded from the process of acquiring writing, due to its complementarity with the use of writing in society, as a way of organizing reality (ALVES; RODRIGUES, 2013).

YOUTH AND ADULT EDUCATION (EJA)

The beginning of the history of EJA is associated with the arrival of the Jesuits in Brazil, in the colonial period, who, as Cunha (1999) states, had as their main objective the religious indoctrination of the population, that is, a more religious character than an educational one.

The history of Youth and Adult Education is similar to the history of youth and adult literacy in Brazil. It began in the 1980s through campaigns against illiteracy, because at that time, it represented one of the country's major social problems. Regarding the literacy process, the EJA has undergone several modifications. In the search for adult literacy that effectively leads to the mastery of written language and not only of technologies, and seeking to insert, in a more complete way, young people and adults in the world of writing, experiences take on different consistencies and build new paradigms (PEREIRA, 2005).

It is believed that, at the heart of the problematization in relation to literacy and the education of young people and adults, is the lack of experience of teachers in the daily lives of students. As far as teachers are concerned, these conditions have to do with their education, with their perception of themselves and their role in the school, with their interaction in relation to knowledge, students, and the classroom space (PEREIRA, 2005).

LEARNING DISABILITIES IN EJA

According to Tfouni (2002), literacy refers to the acquisition of writing as learning skills for reading, writing and the so-called language practices. This is carried out, in general, through the process of schooling and, therefore, formal instruction. Literacy thus belongs to the realm of the individual.

Literacy and literacy are distinct processes, although they can and should go hand in hand. Literacy and Literacy cannot be dissociated, as one complements the other. Thus, it would be necessary to teach literacy and literacy as two distinct but not inseparable actions; on the contrary, the ideal would be to teach literacy by literacy, that is, to teach reading and writing in the context of the social practices of reading and writing, so that the individual becomes, at the same time, literate and literate (SOARES, 2004).

The ideal would be to teach literacy to literacy, hence the importance of not dissociating both. A literate person is one who can only read and write; on the other hand, the literate person is able to go further, meets the social demands of reading and writing, which is why he is able to write a letter, a note, written of his own authorship (SOARES, 2004).

As Freire (1989) said, literacy cannot be reduced to the pure teaching of words, syllables or letters. Literacy is the creation or assembly of written expression from oral expression. Literacy, then, should not be considered only the acquisition of the written code, but a process that guides this

student to read, write and use this reading and writing in social practices, using their experiences and previous knowledge as guides for this process.

According to Soares (2004), an illiterate person can be literate to a certain extent, so that he or she becomes interested in the world of reading and writing, listening to someone read a newspaper article or even dictating something for a literate person to write.

Youth and adult teachers have the mission of taking into account the student's literacy knowledge and developing activities that allow this student to further enrich their knowledge, deepening the characteristics of these writings and thus having a satisfactory social integration (ESTEVES, 2011).

Freire (1989) elaborated the method of Youth and Adult Literacy, based on dialogue, mainly, the dialogue between educator and student, one listening to and respecting the other, since the role of man is that of a subject and not of a simple object.

The teacher has to provide this interaction with the student and work on reality, previous knowledge, and the teachings that he has through his life trajectory. It is not only Reading and Writing, oral speech is also important, because the literate person has a different way of speaking from an illiterate or illiterate person, the one who lives with writing has his oral language changed, the way of speaking and vocabulary changes (SOARES, 2004).

Therefore, it is worth noting that one of the main functions of EJA is to repair the educational damage denied to this part of society and to provoke changes not only in the subjects involved. Therefore, it is necessary to keep in mind that this type of teaching is a little more complex than the others, because EJA students are young people and adults, workers or not, mature, possessing a conscience and a formed knowledge about the school and the world, which must be respected (ESTEVES, 2011).

READING AND WRITING AS TOOLS IN YOUTH AND ADULT EDUCATION

From the perspective of Youth and Adult Education, the teaching content is constituted in a popular way and represents an "instrument of man's fulfillment", and the form of work meets social ideals, in accordance with the degree of development experienced in the process. The relationship of interdependence between form and content clarifies that the method needs to be defined depending on the social meaning of the content (ALVES; RODRIGUES, 2013).

EJA strives for a critical conception of teaching-learning conceived by the reflexive way of thinking and contradicts the naïve conception of education. Critical consciousness, called into question, conceives knowledge as a product of real existence: it considers the cultural moment, the concrete presentation and knowledge as part of the individual's reality, deriving from the experience of the subjects and being part of the rational capacity.

When discussing the value of illiteracy rates and educational statistics in general, it is understood that critical consciousness analyzes data to understand the relative social value, and the context of its existence, and then assigns value. The critical notion of adult literacy considers that it is necessary to awaken the critical consciousness of the learner, and the knowledge of reading is only one element of this larger construction, which is the awareness of the need to reach the literate plane. However, society becomes the educator of the educator and the historical time determines the general interests of the moment, and it is then up to the collective to convert the teacher into an active force in the economic and cultural development of society, with the establishment of a critical pedagogical theory, in which educator and student educate each other reciprocally (ALVES; RODRIGUES, 2013).

Youth and Adult Education perceives man as the subject of the process that requires methods appropriate to its concreteness. There is a need to establish a careful look at the social context of individuals, considering the influence of language on the identity of the subjects, even because language brings together values, and the systems of expression have intention and can occur verbally or non-verbally (RIBEIRO, 2006).

As an obstacle to be overcome, the written code is discovered by the group of young people and adults, and as they become aware, they become literate. In Youth and Adult Education, from the beginning of the literacy process, the discussion is provided to the group, so that the challenges are overcome and the power of reflection of conscience is also exercised. In this sense, the educational process needs social contents, involving consciousness and the world, word and power, knowledge and politics, soon theory and practice (FREIRE; NOGUEIRA, 2001).

One of the main concerns in the teaching/learning process in the EJA modality is reading and writing. Collelo (2004) states that the ability to read and write does not depend exclusively on the subject's ability to "add pieces of writing", but on understanding how the structure of language works and the way it is used in our society.

It is worth noting that literacy teachers should always be evaluating their practice in the classroom, since it is not possible to evaluate without self-evaluation. According to Freire (1991), literacy goes far beyond the mechanical decoding of words, it has a much broader meaning, since it enables a critical reading of reality, constitutes an important instrument for rescuing citizenship and reinforcing citizen engagement in social movements that fight for the improvement of quality of life and social transformation.

Thus, reading and writing can be seen as mechanisms of interaction and social inclusion, which enable the individual to understand the information that is essential for better performance in their coexistence with others and with the world around them.

METHODOLOGY

CHARACTERIZATION OF THE MUNICIPALITY OF CONGO-PB

The municipality of Congo is located in the Congo Microregion and in the Borborema Mesoregion of the State of Paraíba. Its area is 274 km², representing 0.4856% of the State, 0.0176% of the Region and 0.0032% of the entire Brazilian territory. The seat of the municipality has an altitude of approximately 480 meters, 212.0009 km from the capital. Access is made from João Pessoa by the highways BR 230/BR 412/PB 214 It is inserted in the Folha SUDENE de Sumé (CPRM, 2005).

The inhabitants are called Congolese. The municipality had 4,602 inhabitants in the last census. The population density is 14.1 inhabitants per km² in the territory of the municipality. Neighboring the municipalities of Salgadinho, Coxixola and Caiçara, Congo is located 50 km north of Brejo da Madre de Deus, the largest city in the vicinity. Located at an altitude of 492 meters, Congo has the following geographical coordinates: Latitude: 7" 47" 41" South, Longitude: 36" 39" 42" West (CPRM, 2005).

The municipality was created in 1959, the total population is 4,602 inhabitants, 2,176 of which are in the urban area. Its Human Development Index (HDI) is 0.631 (Atlas of Human Development/UNDP, 2000).

There are 208 permanent private households with toilets connected to the General Sewage Network, 618 permanent private households with water supply connected to the General Water Network, and 343 permanent private households have garbage collected (CPRM, 2005).

There are 16 hospital beds in 04 health establishments that provide services to the SUS. Elementary School has 1,049 enrollments and High School 213. In the Articulations between the Institutions, there is the Cooperation Agreement with Public Entities in the areas of education, health, transport and economic development and the Intermunicipal Consortium in the area of health.

The municipality of Congo is predominantly inserted in the geoenvironmental unit of the Sertaneja Depression, which represents the typical landscape of the semi-arid Northeast, characterized by a very monotonous pediplanation surface, predominantly smooth-undulating relief, cut by narrow valleys, with dissected slopes. Residual elevations, ridges, and/or hillocks dot the horizon line. These isolated reliefs testify to the intense cycles of erosion that affected a large part of the northeastern hinterland (CPRM, 2005).

OBJECT OF STUDY

The research was carried out at the Municipal School of Elementary Education of Congo, located at Rua Senador Rui Carneiro, S/N, Centro, urban area of the municipality of Congo.

The School has a staff of about 37 (thirty-seven) teachers, distributed from the 1st to the 9th year of Elementary School I, 90% of these have higher education and 22 (twenty-two) are employees, distributed in: administrative assistant, general services assistant, watchmen, who work in different shifts, cooks and secretaries. The school meets a demand of 635 (six hundred and thirty-five) students.

The school operates in the three shifts (morning, afternoon and evening), in the evening the Youth and Adult Education classes operate.

DATA COLLECTION

Data were collected from the application of a questionnaire/anamnesis composed of 10 questions, within a specific dynamic for the application of the questionnaire, organized in a single moment.

DATA ANALYSIS PROCEDURE

Following the perspective of the Survey, in this phase the data were listed, grouped into categories, statistically treated and presented in the form of figures (graphs) with the aid of a computer application EXCEL and also with the aid of a text editor application WORD.

TYPE OF RESEARCH

The present study is of the exploratory-descriptive type with a quantitative approach, through a field research technique, specifically a survey, with the use of instruments in the form of a questionnaire (TRIVINOS, 1992).

From the Survey technique, answers to the multiple-choice questions formulated in the research instrument were used, and the answers were transformed into codes, in order to allow a better grouping of the data and, consequently, their presentation.

Quantitative analysis, as Trivinos (1992) reminds us, refers to data that have a type of objectivity and conceptual validity. Thus, quantitative analysis transforms opinions and information into numbers, by means of statistical resources and techniques to classify and analyze them.

As for the purposes, the research is characterized by being of the exploratory type, which, according to Silva and Menezes (2001), aims to identify the factors that determine or contribute to the occurrence of the phenomena. It also deepens the knowledge of reality because it explains the reason, the "why" of things.

As for the means, the research becomes descriptive. For Rudio (1999), descriptive research is interested in discovering and observing phenomena in order to describe, classify and interpret them.

The field research consisted of the observation of facts and phenomena and the collection of data for later analysis.

POPULATION AND SAMPLE

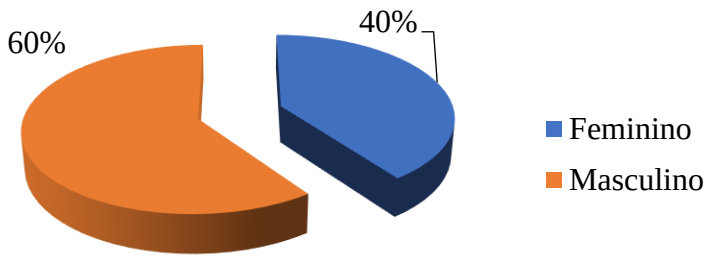
The research was carried out with the students of the EJA of the Municipal School of Elementary Education of Congo, located at Senador Rui Carneiro Street s/n, Urban Zone of the Municipality of Congo – PB.

The EJA class consists of 55 students. Of these, 20 students were interviewed. In the school there are 08 (eight) teachers who work with EJA, and 05 (five) of them were interviewed.

RESULTS AND DISCUSSION

Figure 1 shows the results regarding the percentage of men and women who study in the EJA classes at this school.

Figure 1 – Percentage of users with respect to gender.

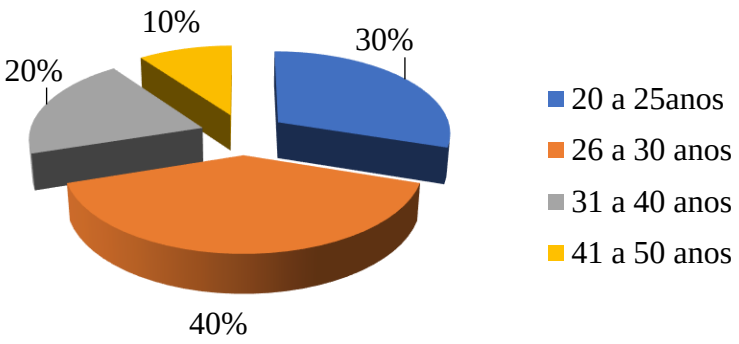


Source: Survey data, 2017.

Figure 1 shows that 60% of the EJA audience are men and 40% are women. The current Brazilian Federal Constitution clearly states that all people are given the right to education, equal conditions for access to and permanence in school, and equality between the sexes. However, what may justify the great demand of males for the EJA teaching modality is the fact that most men enter the labor market at an early age, being unable to attend regular school.

Figure 2 illustrates the results regarding the percentage of students in relation to their age group.

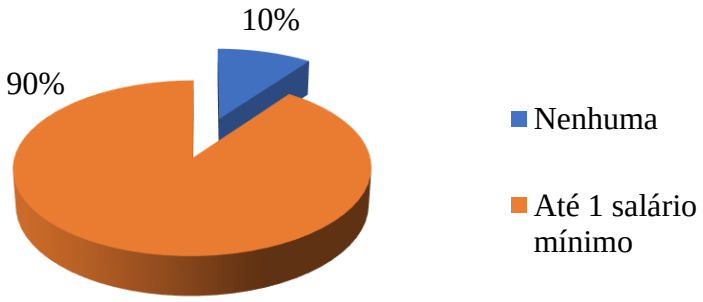
Figure 2 – Percentage of students in relation to age group.



Source: Survey data, 2017.

The data in Figure 3 illustrate the information regarding the students' family income.

Figure 3 – Percentage of respondents in relation to family income.

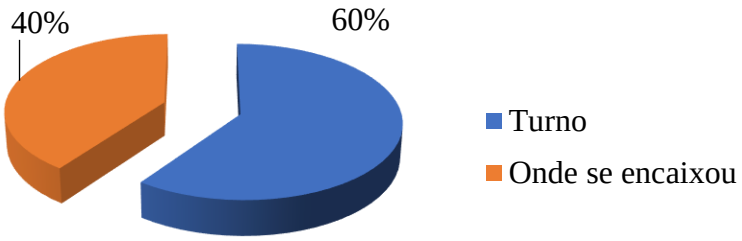


Source: Survey data, 2017.

Figure 3 shows that 90% of the students receive up to one minimum wage and only 10% have no income and survive depending on other people. This reality may be the result of the reduction in the supply of jobs and the productive and administrative rationalization undertaken by companies.

Figure 4 shows the reasons for choosing the EJA modality.

Figure 4 – Why the choice of EJA?

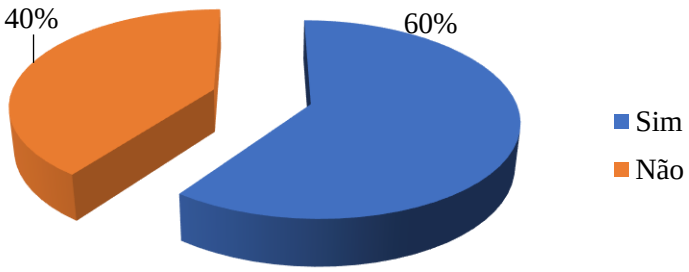


Source: Survey data, 2017.

Figure 4 shows that 60% of the students chose EJA because of the course shift, while 40% chose it because it was the most appropriate teaching modality for their living conditions.

Figure 5 illustrates the percentage of responses to the question "Have you achieved your reading and writing goals?"

Figure 5 – Answers to the question "Have you been able to achieve your reading and writing goals?"

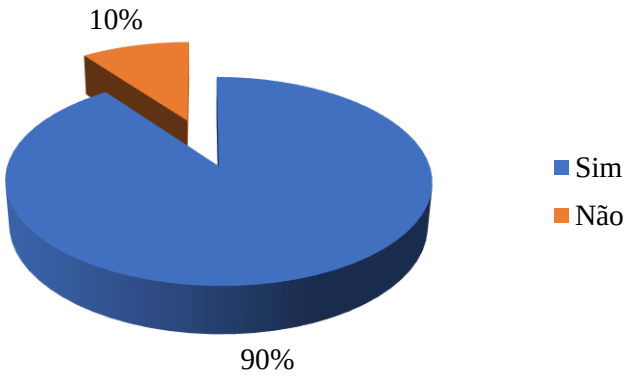


Source: Survey data, 2017.

According to Figure 5, it was found that 60% of the students were able to achieve their reading and writing goals or are succeeding; only 40% are not. Based on the Brazilian socio-political context and, especially, the educational demands aimed at young people and adults, reading and writing are considered as basic and interdisciplinary skills for the full realization of the social function of the school.

Figure 6 shows the results of the question asked to the students: "Did you have difficulty learning to read?".

Figure 6 – Question: "Did you have difficulty learning to read?"

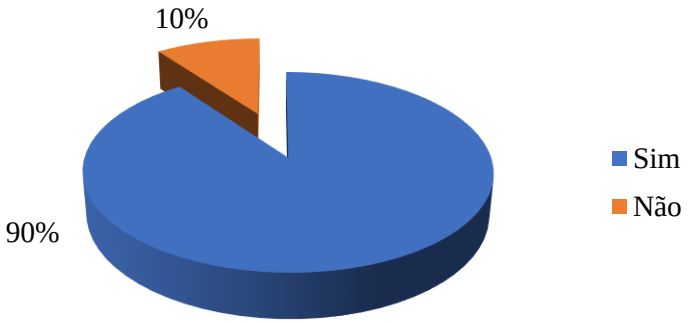


Source: Survey data, 2017.

As shown in Figure 6, it was observed that 90% of the students felt difficulty in learning to read, only 10% did not. Language is the main system of culturally constructed signs. Reading and writing take on the character of social and cultural practice and become experiences constituted in the interaction between subjects who actively participate in the attribution and construction of meanings to everything that is around them. Silva (1984), when addressing this issue, explains that understanding the message, understanding oneself in the message, understanding oneself through the message are the three fundamental purposes of reading, which far go beyond any utilitarian or merely "bookish" aspects of reader-text communication. Reading is, ultimately, not only a bridge to awareness, but also a way of existing in which the individual understands and interprets the expression recorded by writing and begins to understand himself in the world.

Figure 7 illustrates the results of the students' questioning: "Did you have difficulty learning to write?"

Figure 7 – Question: "Did you have difficulty learning to write?"



Source: Survey data, 2017.

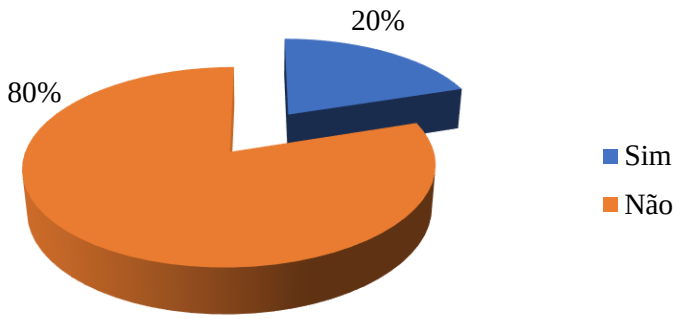
As shown in Figure 7, it was observed that 90% of the students felt difficulty in learning and only 10% did not. Reading and producing texts, nowadays, are processes that need to be faced by the

school no longer from their mechanical and repetitive nature. It is necessary to broaden the conceptions linked to them, taking into account, on the one hand, the complexity inherent to these processes and, on the other hand, the scenario that contemporaneity presents (BUOGO *et al.*, 2013).

In this context, reading and writing need to be seen as processes that go beyond the mere activity of deciphering and decoding signs. They represent, in reality, the possibility of people accessing the world, expressing it and interacting in it with knowledge and with other human beings. At the heart of this possibility is the meaning of human communication, since reading and writing enable interrelations, exchanges, growth, and collective learning (SOARES, 1994).

Figure 8 represents the students' knowledge of reading before studying in EJA.

Figure 8 – Answers to the question "Did you already know how to read before studying at EJA?".

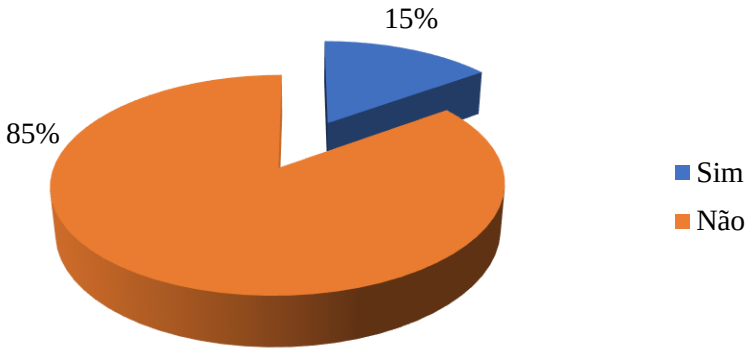


Source: Survey data, 2017.

As shown in Figure 8, 80% did not know how to read before studying at EJA, and only 20% did. EJA students bring with them a worldview influenced by their cultural traits of origin and by their social, family and professional experience. By choosing the path to school, the question begins to accompany the student's vision, leaving him prepared to look. Open to learning, they come to the classroom with a gaze that is, on the one hand, a receptive, sensitive gaze, and, on the other, it is an active gaze: a curious, exploring gaze, a gaze that investigates, a gaze that thinks.

Figure 9 illustrates the students' knowledge of writing before studying in EJA.

Figure 9 – Answers to the question "Did you already know how to write before studying at EJA?".



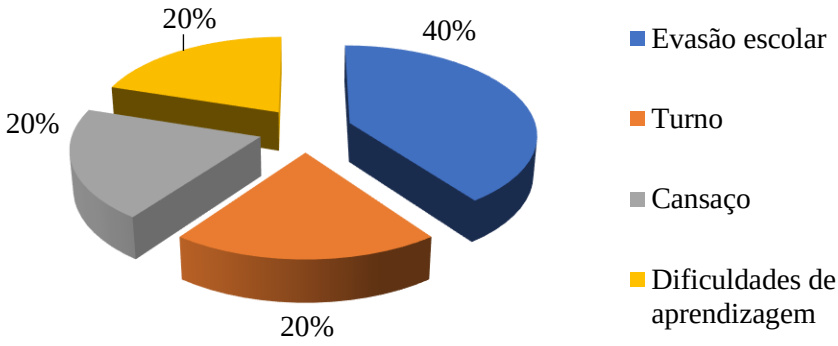
Source: Survey data, 2017.

According to Figure 9, 85% of the students did not know how to write before studying in EJA, only 15% already had this knowledge. The knowledge of a person, who seeks school late, is innumerable and acquired throughout his life history.

Sensible knowledge is a knowledge sustained by the five senses, a knowledge that everyone possesses, but which is little valued in modern life. It is that knowledge that is little stimulated in a classroom and that many teachers attribute their exploration only to art classes (MINISTRY OF EDUCATION, 2017).

Figure 10 shows the results regarding the difficulties encountered by teachers in the EJA classroom.

Figure 10 – Difficulties in the classroom.



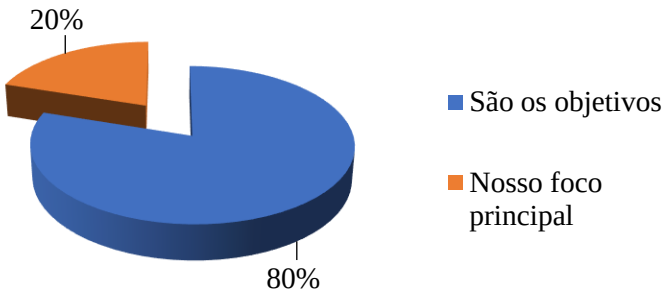
Source: Survey data, 2017.

According to Figure 10, it was observed that 40% of the difficulties in the classroom originate from school dropout, 20% from the question of the shift, 20% due to fatigue and 20% due to learning difficulties. The teaching of EJA is precisely aimed at the search for awareness of this subject, enabling him to act and react to concrete situations of his reality. Youth and Adult Education needs

flexibility in its curricular organization. To this end, it is necessary to make evaluations of the reality of which this student is a part, in order to have the regional culture as a basis, thus providing the appropriation of the universal culture. Difficulties exist and will exist, it is up to those involved to overcome them (HAIDT, 1999).

Figure 11 illustrates the result regarding the role of reading and writing in EJA teaching.

Figure 11 – Role of reading and writing in EJA teaching, in the opinion of teachers.

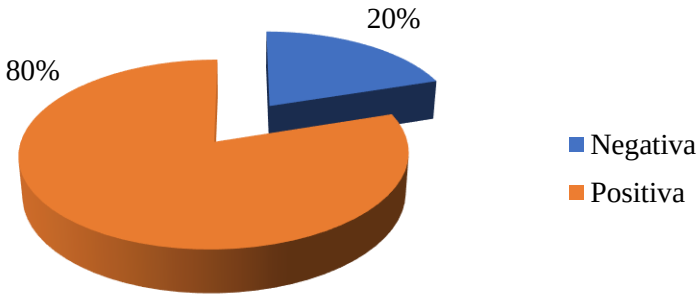


Source: Survey data, 2017.

According to Figure 11, it can be observed that 80% of teachers evaluate the role of reading and writing as the main focus; 20% said they are EJA's goals. The process of student development contributes to the success between learner and educator with full respect, considering each individual as an unexplored source of knowledge. With this, the potential of each one is evaluated, the differences respected, all the student's baggage valued, their reality observed and, through solid knowledge, the action to be able to transform it for their own benefit (HAIDT, 1999).

Figure 12 shows the evaluation of the students by the teachers in relation to reading in EJA.

Figure 12 – Evaluation of students by teachers in relation to reading in EJA.

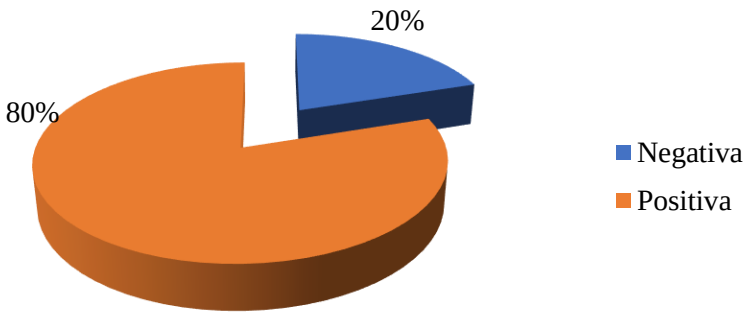


Source: Survey data, 2017.

According to Figure 12, 80% of the teachers evaluate the relationship to reading in EJA positively and only 20% analyzed it negatively. Teaching requires dedication and love. The teacher is knowledgeable and capable of making the students transform their realities, encouraging them to awaken, to the desire for change, to want to go further.

Figure 13 shows the results of the teachers' evaluation of the students' performance in writing.

Figure 13 – Evaluation of teachers in relation to students' performance in writing.

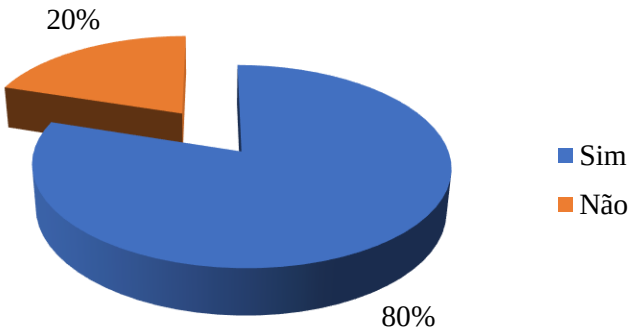


Source: Survey data, 2017.

According to Figure 13, it was observed that 80% of the teachers evaluate the students' performance in writing positively and only 20% evaluate it negatively. For Haidt (1999), learning is the assimilation of new data to previous mental schemas, and the consequent reorganization or restructuring of previous assimilated data to fit the new data. Therefore, for young people and adults to feel part of the classroom context, it is important for the educator to respect the reality of the learner.

Figure 14 illustrates the teachers' opinions regarding the question "Are you achieving your goals in EJA teaching?".

Figure 14 – Question: "Are you achieving your goals in teaching EJA?".



Source: Survey data, 2017.

Figure 14 shows that 80% of the teachers are achieving their goals, but only 20% are not. Youth and Adult Education is not only about the content to be taught, but also about learning techniques and means to obtain knowledge, that is, learning how to learn. This is of fundamental importance when adults are expected to develop certain skills so that, through these, they can build and develop their competencies.

The relationships observed in the vast majority of the EJA classroom, between teachers and students, is a horizontal relationship, of equals. In it, everyone learns, has a voice and the right to participate constantly, giving opinions, often making criticisms, in a constructive way to favor the development of the group, respecting the difficulties encountered with learning.

In the case studied, the students claimed to have difficulties in learning to read and write and, despite this, they managed to overcome themselves and acquire the learning of reading and writing. Teachers also face difficulties in the classroom, attributed to fatigue, the shift in which classes are held, and difficulties in understanding students.

Despite this scenario, the primary objectives of EJA (to develop students' reading and writing skills) are being achieved.

CONCLUSIONS

According to the results presented, it can be concluded that:

- It was observed that in the universe surveyed there is a predominance of males, with the predominant age group being between 26 and 30 years old, which leads to the deduction that they are individuals in full work activity.
- Most survive on just one minimum wage, an income that comes from the Federal Government's Bolsa Família program, as well as from precarious jobs without labor rights in the informal sector.
- It was also observed that the students feel stimulated by the EJA professionals, taking into account that the teachers value the experiences of each one.
- Most of them have already managed to achieve their goals in EJA, which are to read and write, despite experiencing difficulties.
- Regarding the results related to teachers, it can be observed that the most common types of learning difficulties in the classroom are: school dropout, the shift in which classes are held, fatigue and learning difficulties.

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Mental health in the elderly: A brief psychosocial analysis in a geriatric residential in the midwest of Santa Catarina

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ABSTRACT

With the aging process, there are several changes in quality of life and lifestyle that can lead to the development of psychiatric syndromes. Studies cited in this article show that prevention and health promotion interventions have been shown to be essential to avoid such syndromes. In view of this, a descriptive and exploratory study was elaborated in order to prove in practice the theory found of promotion actions, for this, a nursing home in the midwest of Santa Catarina was chosen as the target audience. From this, it was obtained the proof that approximately 70% of the elderly had difficulty in the proposed activities that assessed cognition and memory, thus exposing the importance of practicing activities that stimulate the cognitive areas. Finally, a booklet with tips was passed on and explained to the professionals of the place to work with the elderly, to prevent and promote their mental health.

Keywords: Mental Disorders, Mental Illness, Depression, Senior, Quality of life.

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INTRODUCTION

The study of aging and old age, as processes of the life cycle, is today one of the main points of attention of social and governmental agents, as well as of medicine in general (BARBOSA; BIERMANN; PEIXOTO JÚNIOR; ALMEIDA, 2013). It is notorious that in recent decades, there has been a large increase in the population over 60 years of age, and it is expected that by 2050 there will be a 223% increase in people in this age group, totaling two billion elderly people worldwide (LEANDRO-FRANÇA; MYRTLE, 2014).

In Brazil, the number of elderly people reached 32.9 million in 2019, and according to the Brazilian Institute of Geography and Statistics (IBGE), the aging of the population remains constant (PREVIVA, 2018). Still speaking of this population aging, it is estimated that by 2060, the number of people aged 65 and over will triple, reaching the equivalent of 25.5% of the population (PREVIVA, 2018).

We know that the older the population gets, the more the costs of health services to the government increase, which can create a collapse in the public health system. It is always interesting to create strategies to reduce this burden on the Brazilian health system, and certainly, investing in policies for the prevention and stabilization of chronic diseases is fundamental. Among the diseases In order to ensure the maintenance of the functional capacity of patients with these pathologies, we emphasize the chronic diseases that deserve special attention, with a view to reducing costs for Brazilian public health.

According to Gato, Zenevicz, Madureira, Silva, Celich, Souza and Léo (2018), in order to avoid compromises and greater restrictions, public policies focused on functional and healthy aging should include measures to reach advanced ages with a better quality of life. Related to the mental health of the elderly, action plans should provide for the application of strategies that promote the prevention of mental disorders, their early detection when present, the appropriate management of these diseases, and the training of professionals and family members who care for this public (LEANDRO- FRANÇA; MYRTLE, 2014).

Para Gato *et al.* (2018, p. 304):

> "(...) The national policies of primary care, health care for the elderly, health promotion and humanization in the SUS intend to subsidize multiprofessional, interdisciplinary and intersectoral work promoting health conditions for the aging population"

In addition, it is important to point out that the aging process occurs concomitantly with several changes in quality of life and lifestyle that can lead to the development of psychiatric syndromes, such as: loss of contacts and social functions; abandonment; social isolation; inability to engage in activities; lack of social return; retirement; limitation in mobility, development of chronic diseases and conditions; and the loss of loved ones (BARBOSA *et al.*, 2013).

Leandro-França and Murta (2014) highlight that, according to the specialized literature, interventions for the prevention and promotion of mental well-being offer excellent potential in promoting empowerment in health and citizenship, planning and adaptation to the new lifestyle, and these factors seem to positively influence quality of life and consequently the development/management of psychiatric disorders.

In this sense, the main psychiatric disorders that affect the elderly for Lacerda (2018) are depression, anxiety disorders (panic and generalized anxiety disorder), bipolarity, schizophrenia and dementia, the latter being represented by Alzheimer's disease and classified as Alzheimer's disease higher prevalence. Therefore, knowing these diseases, their signs, symptoms and how they manifest themselves in this age group become important and relevant today.

Therefore, it is pertinent to take a look at this theme, and, mainly, at this age group that will gain more expressiveness in the coming years, in an attempt to make evident the main diseases that affect this population in order to recognize and be able to give due support to those who already suffer from these psychiatric changes, as well as to act in their prevention, thus avoiding the overload of our public health system.

The objective of the article is to recognize the psychosocial aspects of old age, analyze vulnerabilities, identify the most prevalent mental disorders, produce actions that stimulate memory and cognition, and finally inform the importance of mental health stimulation.

METHODOLOGY

The present work is a descriptive and exploratory research with qualitative foundations. For the literature review, searches were carried out in the databases of *the Acientífica Electronic Library Online* (Scielo) and the Virtual Salde Library (VHL), for the discussion of the project, articles between 2006 and 2017 were analyzed. In addition, the study has an extension activity for the target audience, which is the elderly population, this action is of a multiple nature with the objective of correlating the literature review with the practice experienced, resulting in benefits for the community and for the current research.

To this end, a visit was made to a nursing home in the Midwest of SC to elaborate activities with a group of 24 elderly people and 18 nursing home professionals. This action included the elaboration of musical recreations to reach the emotional aspect and memories of the elderly group. In addition, an informative material was prepared with tips for caregivers to stimulate memory and reasoning, presented and discussed among the professionals, as shown in Figure 1.

Figure 1. Tau Integrative Project, UNIARP (2022).

Source: Prepared by the authors.

RESULTS AND DISCUSSIONS

In view of the methodology detailed above, it is possible to conclude that most of the elderly participants in the study presented difficulties when it came to memory and cognition stimuli. Since, when cognitively stimulated, these individuals demonstrate a marked deficiency in this process, so that they could not understand the proposed activities - making it necessary to adapt on the part of the applicators -, they also exhibited too much difficulty when stimulated with music, so that approximately 70% of the elderly could not recognize the songs played, indicating that there was a deficiency in this aspect.

In view of the above, it is possible to observe the high vulnerability of the third age in relation to mental health, since, due to the senescence and senility they face, there is the development of psychiatric syndromes and a decrease in cognitive conditions together with biopsychosocial factors, such as abandonment, the inability to engage socially and genetics itself.

In relation to the professionals, it is noted that they perform numerous activities to work on the mental health and psychosocial aspects of the elderly, through group and individual dynamics, such as, for example, the use of word searches, dominoes, use of music, among others. Through the extension project, we seek to reaffirm to these caregivers the importance of promoting daily activities

with a psychosocial focus, in order to try to minimize the deficiencies and difficulties presented in the items mentioned above, aiming to improve the quality of life of these individuals.

FINAL THOUGHTS

Functional and healthy aging should include measures to reach advanced ages with a better quality of life. Regarding the mental health of the elderly, action plans should include the application of strategies that promote the prevention of mental disorders, their early detection when present, the appropriate management of these diseases, and the training of professionals and family members who care for this public.

Therefore, it is pertinent to look at this theme to make evident the main diseases that affect this population in order to recognize and give due support to those who already suffer from these psychiatric alterations, as well as to act in their prevention, thus avoiding the overload of the public health system.

The present study sought to correlate the literature review with the lived practice, and, based on this experience, it was possible to conclude that most of the elderly participants in the study presented difficulties when it came to memory and cognition stimuli. The vulnerability of the elderly in relation to mental health was observed, since, due to senescence and senility, the development of psychiatric syndromes and decreased cognitive conditions are common, even when constantly stimulated by the multidisciplinary team in charge.

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Peer-to-peer learning and collaborative knowledge building in face-to-face and online environments

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ABSTRACT

This paper presents a discussion about the method of peer instruction or peer instruction, as an active methodology. From the origin of the method in the early 1990s to the present day, this methodology has been successfully employed in several educational institutions, especially in higher education courses, as well as in basic education schools. This article aims to briefly discuss the use of the teaching method created by Eric Mazur who realized the need to bring better results to his classes through the active participation of his students. To this end, bibliographic research was used as a work methodology, since the field of reflection that is presented here is the result of the readings and contributions of several theorists who deal with the theme in question, that is, the active methodologies and among them, peer instruction. At the end of the preparation of this text, it was possible to conclude through the readings and studies that the peer instruction method can be easily applied in different learning environments, whether for face-to-face or online classes and without great costs, as it does not require technological resources to be executed.

Keywords: Active methodology, Peer instruction, Teaching, Learning.

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INTRODUCTION

Nowadays, we often see that students are constantly bombarded with information and news from digital media and even new technologies, a situation that can negatively influence their autonomy and motivation to study. Allied to this, we see that a considerable portion of teachers remain stuck in traditional teaching methodologies. However, active methodologies offer an effective pedagogical approach to dealing with this reality. Instead of just passively receiving information, with active methodologies students are encouraged to be actively involved in the learning process and among the various methodologies that escape the traditional bias, peer instruction can be mentioned .

We understand that active methodologies are based on a theoretical conception that goes back to Paulo Freire and other constructivist theorists, since the incentive to student autonomy and learning predominate. In this sense, it is important to highlight that

Promoting meaningful learning requires, first of all, a teaching methodology that is capable of involving the student as the protagonist of their learning, also developing a critical sense in the face of what is learned, as well as skills to relate this knowledge to the real world. Such a process seems to become possible with the use of what we call active learning methodologies (Pinto, et al. p. 78).

In this way, by promoting collaboration among students and actively involving them in the learning process, active learning methodologies not only improve the understanding of concepts, but also develop essential skills, such as critical thinking, communication, and teamwork. It is worth noting that the success of this approach depends on the teacher's ability to create a stimulating and inclusive learning environment, where students feel motivated to actively participate and contribute to collective learning.

Studies show that the adoption of active methodologies in classes contributes greatly to overcoming students' lack of autonomy and willingness to study, in addition to improving academic performance (Freeman, et al. 2014. p. 8012). By carrying out team projects or simulations, students learn to work together, share ideas and solve problems collectively, strengthening their social and communication skills and also increasing their motivation by feeling an integral part of an engaged and collaborative learning context.

The use of active methodologies is essential to engage and motivate students who may be more passive or less participative. These methodologies offer practical opportunities for students to be actively involved in the learning process, making them protagonists of their own educational development. Rather than simply absorbing information, students are challenged to apply knowledge in real-world situations, solve problems, and collaborate with peers. Not only does this encourage deeper learning, but it also fosters valuable skills such as critical thinking, creativity, and teamwork.

Thus, the present work aims to present a brief discussion about the use of the method created by Eric Mazur, peer *instruction* . To this end, bibliographic research was used as a work methodology, since the studies presented here do not deal with field research, or analysis of public policies, or interviews or even case studies, for example. Thus, the field of reflection that is presented here is the result of the readings and contributions of several theorists who deal with the theme in question.

To give substance to the present study, first of all, IP as an active methodology will be highlighted[9] , its origin, evolution and importance based on the reflection of several authors. Then, the use of this method in face-to-face or online classrooms will be discussed, as another of the different active methodologies that represent an effective educational approach to face the challenges imposed by the media and the advancement of technologies in the lives of students.

PEER INSTRUCTION AS AN ACTIVE METHODOLOGY

It is commonplace in different academic study environments today that the teaching and learning process undergoes important and profound changes. Schools and teachers need to adapt to the target audience that suffers every day from the interference of new media, social networks, technological advances and social arrangements that are formed in contemporary times. The student has always been the main target of concern and study by institutions and education professionals, however, with the changes that have been occurring, new questions and new concerns arise that need to be answered.

Thus, the school and teachers who use traditional methods to only transmit information no longer meet the expectations of the students, since access to information is no longer a monopoly of the teacher, but is within the reach of any student. In this, the teacher will not be completely replaced, his contact with his students face to face must continue, but it is up to the teacher to understand that there will also be digital interaction with his students, through different technologies (Moran, 2015, p.16).

One response to the challenges discussed above is the adoption of active methodologies in the classroom. The expression "active" is very significant to distinguish this methodology from others, as it involves and engages students in their own learning, making them protagonists of the construction of knowledge. These are situations in the classroom where the student is challenged to leave passivity and act actively. Like this

> active methodologies seek to create learning situations in which learners do things, put knowledge into action, think and conceptualize what they do, build knowledge about the contents involved in the activities they perform, as well as develop cognitive strategies,

[9] From now on, the acronym PI will be adopted to deal with *Peer Instruction.*

> critical capacity and reflection on their practices, provide and receive feedback, learn to interact with colleagues and teachers (Valente, Almeida & Geraldini. 2017. p 459).

In this way, active methodologies are activities that promote participation, autonomy and the development of skills beyond the simple assimilation of information. These methodologies stand out for changing the traditional role of the teacher, who is no longer just the transmitter of knowledge to become a facilitator of learning. The idea is that the student becomes the center of learning and directly responsible for the construction of knowledge.

In this context, it is appropriate to highlight the trajectory of the active methodology developed by Eric Mazur in creating the Harvard, in 1991. Its creation was marked by dissatisfaction with the model traditionally adopted by educational institutions. When faced with the students' lack of interest and passivity in his physics classes, Mazur realized that merely expository classes did not promote meaningful learning, leading him to question the effectiveness of the traditional model adopted by him and other teachers since always (Madeira, 2017, n.p).

Motivated by the desire for transformation in the way of teaching, Mazur immersed himself in research on active learning in search of alternatives that would put students at the center of the process. In this way, the methodology created by the author aims to "involve students in cooperative activities of content discussion to make learning effective" (Ferreira & Moreira, 2017, p.4) Thus, the exchange of ideas promotes collaborative learning, the construction of knowledge and the identification of doubts among students. In this sense, Eric Mazur and Catherine Crouch themselves point out that the IP method manages to involve practically the entire class and not just those more motivated and diligent students who usually stand out in traditional teaching classes (Crouch & Mazur, 2001, p. 970).

Undoubtedly, with greater student participation in classes, teachers are not limited to just transmitting information, but focus efforts on optimizing the content to be worked on without the need to detail, but on "presenting the key points of the content in a short way" (Ferreira & Moreira, 2017, p.4). Araújo and Mazur corroborate the discussion by stating that

> Instead of using class time to transmit in detail the information present in the textbooks, in this method, classes are divided into small series of oral presentations by the teacher, focused on the main concepts to be worked on, followed by the presentation of conceptual questions for students to answer first individually and then discuss with their classmates (Araújo & Mazur, 2013, p. 367).

In this sense, the IP contributes appropriately to the proposal inherent to all active learning, which is to remove the student from the passive role and mere receiver of knowledge and to become the main actor of his teaching-learning process. In addition, by "receiving immediate, real-time feedback on students' learning" (Chicon, et al., 2018, n.p.), the teacher is able to adapt the strategies

and essential content throughout the stages of IP execution to ensure that the student's learning is built throughout his or her trajectory and effort.

PEER-TO-PEER INSTRUCTION IN FACE-TO-FACE AND ONLINE LEARNING ENVIRONMENTS

We live in a world in constant transformation and with this education seeks to keep up with the fast pace of change, seeking innovative methodologies that promote meaningful learning and actively engage students. It is in this scenario that IP emerges as an important and innovative tool, capable of transforming face-to-face and online classrooms into dynamic and collaborative environments.

In the face-to-face modality, the use of IP can be introduced in a significant or even impactful way, since during class, the teacher can present key concepts and then propose challenging questions to students. Instead of simply answering, students discuss among themselves in small groups to arrive at a consensual answer. This interaction promotes collaboration among students, encouraging them to explain and deepen their understanding of the topics covered and in addition to retaining the subject worked, students gain in self-esteem and proficiency when teaching each other (Azevedo, et al., 2022, p. 5). Similarly, the PI methodology can be successfully applied in online classes.

According to Morán (2015, p.22), "one of the most interesting models of teaching today is to concentrate in the virtual environment what is basic information and leave the most creative and supervised activities to the classroom". However, through digital resources, it is possible to develop online classes that are as attractive as face-to-face ones, either by creating discussion forums, chat rooms, or even video rooms to allow interaction between students. During a virtual class, the teacher can ask challenging questions using tools such as online polls, real-time quiz platforms, or even through the strategy of using games or gamers (Ferreira & Moreira, 2017, p.5). Students then can discuss their answers in virtual groups, sharing ideas and opinions while developing their communication and critical thinking skills.

Peer instruction, therefore, reveals itself as an innovative and effective methodology, capable of transforming teaching and learning into a dynamic, collaborative, and meaningful process. Through careful implementation and adaptation to different educational realities, IP has the potential to drive student success and prepare future generations for the challenges of the ever-changing world.

Like any other active methodology, it is worth noting that the IP proposes that the student adopts a more autonomous and active posture in the face-to-face classroom, and it is sometimes necessary to sensitize students so that they get involved and start to have active behaviors (Silva, et al., 2019, p. 439 as cited in Ribeiro, 2016, n.p).

FINAL CONSIDERATIONS

The active *Peer Instruction* methodology offers an effective approach to foster active student participation and enhance understanding of concepts. By encouraging collaboration among students and the discussion of ideas, PI not only encourages critical thinking but also creates an engaging learning environment. This methodology can be easily implemented in both physical and virtual classrooms, taking advantage of the technological tools available to facilitate interaction between students. Its flexibility and adaptability to different educational contexts make it a valuable strategy for promoting a more dynamic and student-centered education.

Therefore, PI stands out among active methodologies by allowing students to take a more active role in their own learning, while also developing essential interpersonal and collaborative skills. Its applicability in different environments, whether virtual or face-to-face, significantly expands the dynamics of the classroom and promotes a more participatory and effective education. In an ever-evolving educational landscape, *Peer Instruction* stands out for offering students the opportunity to learn collectively and cooperatively, overcoming frequent barriers in the traditional relationship between teacher and student.

Thus, *Peer Instruction* stands out as a promising strategy for cultivating a more interactive and meaningful learning environment, successfully adaptable to both face-to-face and online classes.

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The teaching of trigonometry using the *Geogebra* software as a teaching - Learning tool

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ABSTRACT

Researches have been revealing the great technological advancement and its potential in all fields and how its use can cause good results in the educational area. It is noted that technology is a great ally of all people and one of the points highlighted in this work is the use of technological means to use them as tools in the teaching-learning process. Therefore, this research was developed as an alternative for the teaching of Trigonometric Functions, specifically Sine and Cosine, using a free software to improve the graphic visualization of the functions, the understanding and the interest of students in the subject. This computational resource provides students and teachers with another environment in which learning can be stimulated, through the union of computer resources directed to the teaching of mathematics. Thus, this work aims to analyze how much Geogebra can contribute to the teaching of trigonometric functions, exploring their variations in relation to the resources that the software has. The work was developed in two classes of the second year of high school at the Federal Institute of Northern Minas Gerais, Salinas Campus. In the research, activities were developed on the variations of the sine and cosine functions. One class developed the activities using only basic school materials for mathematical study and in the other, the Geogebra software was used as a tool, in order to improve visualization and understand variations. The results of the activities revealed that the Geogebra software presents itself as an important educational tool in the visualization, understanding of the elements, concepts and their variations. Therefore, this teaching methodology presented us with the benefits of the technique in favor of mathematics education, using a specific software to contribute to the student teaching-learning process.

Keywords: Teaching-Learning, Trigonometric Functions, Geogebra, Tool.

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INTRODUCTION

Trigonometry arose with the idea of associating shadows cast by a vertical rod with hours of the day: sundials, called gnomon, a name given by the Greeks, according to the historian Herodotus (490 – 420 BC), Souza (2014). Figure 1 shows a sundial still in use in the fifteenth century

Figure 1: Fifteenth-century sundial

Source: Photo taken at the Epic of the Discovery in Porto Seguro – Bahia – Brazil

Today we can describe several applications for trigonometry, such as: satellites, astronomy, aviation, engineering, physics, medicine, topography, geography and many other areas. Trigonometry is a part of mathematics that works with triangles, circles, waves, and oscillations.

This work was conceived as a proposal to improve the teaching-learning of trigonometry, specifically of the trigonometric functions sine and cosine; using an *Educational Software*: *Geogebra*.

With so many applications in everyday life and in the face of the difficulties presented by most of the students, it is intended to work in a differentiated way the concepts of the trigonometric cycle, the elements of the sine and cosine functions and to understand the variations in the parameters of these functions. Pedroso (2012) in his studies reports that during his teaching activities he perceived many difficulties in the learning of his students in relation to this theme, both in the meanings of the contents developed and in the symbolic language. These difficulties were perceived by both high school and undergraduate students, they see trigonometry as a difficult, meaningless content and are unaware of its applications.

This proposal was developed in two classes of the 2nd year of High School at the Federal Institute of Science and Technology of Northern Minas Gerais – IFNMG – Salinas Campus. The research consists of using *Geogebra as an* auxiliary tool in the teaching of the aforementioned functions in order to improve the visualization and perceive the variations in them. Initially, the approach to the content was worked in a traditional way using only the blackboard with the classes

and later the activities were applied and the results were compared. In one class, the questionnaires and activities were answered in the classroom without any assistance, and in the other, the software was used as a tool to improve the visualization and understanding of the concepts and graphic variations.

In view of these difficulties, *Geogebra was used* as a tool that helps in the visualization and, consequently, in the understanding of this content.

According to the National Curriculum Parameters for High School (PCNEM) – it is necessary to differentiate in the methodologies used in the classroom to obtain scientific-technological learning in High School.

Moran, Masetto and Behrens (2000) state that we learn better when we experience, experience, feel, relate and establish bonds, which strengthens the need to implement differentiated methodologies that involve students more. The use of computers is closely associated with the daily lives of today's young people, who see themselves in a highly interactive and dynamic environment.

The educational mathematical software chosen was *Geogebra*, which according to Pedroso (2012), is a program that allows you to study Algebra and Geometry at the same time.

Brasil (2000) states that trigonometric knowledge is related to the development of skills and competencies as long as its study is linked to applications, avoiding the excessive algebraic calculation of identities and equations. Therefore, emphasize the important aspects of Trigonometric Functions and the analysis of their graphs, skills that can be achieved through the use of computer tools.

Trigonometric Functions are linked to many phenomena in our daily lives, especially those of a periodic and oscillatory nature.Thus, it intends to explore and deepen the variation of the parameters of the sine and cosine functions, since in the applications the functions are modified in all their parameters, and it is important that the student understands their behavior in practice. As an example of the variations, in the textbook Marmo (2008), the author addresses the representation of the Periodic Functions in pulmonary respiration in cyclical processes of inspiration and expiration, where each complete cycle lasts 5 seconds and is described as a function of time as: volume total do ar, (1) $V(t) = \frac{3}{2\pi}[1 - \cos(0{,}4\pi t)]$ com in seconds and the $t \geq 0$airflow, (2) $F(t) = 0{,}6sen(0{,}4\pi t)$ with.$t \geq 0$

Araújo and Nóbrega (2010) add that the use of *software* is not based on a definitive solution of mathematics teaching problems, as well as Trigonometric Functions, but seen as a didactic strategy that mediates the teaching process. The use of the computer as a mere digital notebook does not provide an opportunity for the exploration of mathematical contents. Based on these conceptions, it is necessary to rethink pedagogical strategies in order to effect some change.

Reflecting on the difficulties presented and how to work differently using computer tools in mathematics, the following research problems were formulated: What contributions can the use of *Geogebra* add to the teaching-learning of the Sine and Cosine Functions? And how can we use these tools to improve the learning of these Functions?

In an attempt to present an alternative to such questions, this research has general objectives, to analyze the use of *the Geogebra software* as an auxiliary tool in the teaching-learning process, in classes of the 2nd year of High School at IFNMG – Salinas Campus, in activities involving the Trigonometric Functions: Sine and Cosine.

The Specific Objectives are:

i. To analyze the difficulties encountered by high school students in solving trigonometry problems;
ii. Develop activities with the use of *Geogebra* that help students to know the important elements of Trigonometric Functions and their variations;
iii. Evaluate the use of technological resources in the teaching-learning process, comparing it with traditional teaching in an attempt to improve it; and
iv. Explore the peculiarities of Trigonometric Functions in a critical and investigative way.

Therefore, this work aims to verify if the good development of the student is linked to the use of innovative actions combined with conventional materials: board, chalk, pencil, paper, among others. Associating the use of computers with Mathematics classes can be a great alternative with a diversified methodology. By itself, this practice is not effective, it is necessary for the student-teacher interaction, as well as for the teacher to adapt to the use of new computer techniques.

THEORETICAL BACKGROUND

The national curriculum parameters for secondary education highlight the importance of studying mathematics in a contextualized way, emphasizing its applications, as the text emphasizes:

> The objectives of High School in each area of knowledge should involve, in a combined way, the development of practical, contextualized knowledge that responds to the needs of contemporary life, and the development of broader and more abstract knowledge, which corresponds to a general culture and a worldview. (Brazil, 2000, p6)

The PCNEM also emphasize the need to modify the way mathematics is presented and taught, emphasizing the use of technological resources for greater learning of the discipline.

> This impact of technology, whose most relevant instrument today is the computer, will require a redirection from the teaching of Mathematics under a curricular perspective that favors the development of skills and procedures with which the individual can recognize and orient himself in this world of knowledge in constant movement. (Brazil, 2000, p 41)

According to the PCNEM, the purposes of teaching Mathematics at the high school level indicate as objectives to lead the student to: understand the concepts, apply their mathematical knowledge to different situations, analyze and value information from different sources, using mathematical tools to form their own opinion that allows them to express themselves critically about Mathematics problems, express themselves orally, written and graphic in mathematical situations and value the precision of language, establish connections between different mathematical topics and recognize equivalent representations of the same concept. (Brazil, 2000)

Specifically on trigonometric functions, the PCNEM emphasize the importance of examples applied for a greater understanding, as in the text:

> Another theme that exemplifies the relationship between the learning of Mathematics and the development of skills and competencies is Trigonometry, as long as its study is linked to applications, avoiding excessive investment in the algebraic calculation of identities and equations to emphasize the important aspects of trigonometric functions and the analysis of their graphs. Especially for the individual who will not continue his studies in the so-called exact careers, what must be ensured are the applications of Trigonometry in the resolution of problems involving measurements, especially the calculation of inaccessible distances, and in the construction of models that correspond to periodic phenomena. In this sense, a project also involving Physics can be a great opportunity for significant learning. (Brazil, 2000, p 44)

Thus, it can be highlighted that the importance of differentiated classes with technological resources, contextualized examples, applications in other disciplines and in mathematics itself facilitate student learning and participation.

According to Bonfim (2013), the use of technologies is welcome in the teaching of Mathematics, through programs and *software* that help in the understanding of the contents and in the desire to learn mathematics more and more, to learn how to do mathematics. It also highlights that the use of *software* is an innovative practice that instigates in students an interest in the construction of knowledge, since the computer is part of everyone's daily life. The use of these facilitates the performance of activities that have a higher degree of difficulty.

Bonfim (2013) points out that when using the *software* , a better knowledge of the content is observed by the students, because it is a differentiated class that arouses greater interest. The activities carried out with the help of technologies are most of the time interpreted correctly and when typing a wrong number in the desired function, soon the students realize the flaw, they know how to extract the information from the statement and interpret the plotted graph.

Souza (2014) points out that the computer and its applications today represent a new way of looking at education. New communication technologies are increasingly being incorporated into student life. Thus, it is necessary for the teacher to have a minimum of technological knowledge and a lot of pedagogical knowledge to integrate these new resources satisfactorily into their course program.

Periscano (2013) also points out that the use of *educational software* aims to demonstrate that the use of new technologies within the classroom makes classes much more interesting for students, the contents are better understood and the main objective is achieved, which is the teaching and learning process. In addition, it shows the student that the content studied has a practical application and that the use of this content by the student in his routine life will depend on what professional activity he will follow.

It can also be highlighted that in the use of *educational software* in mathematics classes, specifically in trigonometric functions sine and cosine, they have a more efficient learning and a better visualization of the graphs and their variation in the Cartesian axis, as highlighted by Pedroso (2012), in the results obtained using the Geogebra software, using a The teaching sequence provided students with the manipulation of figures, the observation of variations and properties of constructions. This dynamism and interactivity provided significant learning, as the group moved from the posture of listening to explanations to the posture of hypothesis investigator.

The use of computational resources in the classroom is not in itself the mechanism that will lead students to learning, but a tool that will help the teacher in the teaching-learning process, as highlighted by the authors Araújo and Nóbrega (2010). The use of *computational software* is not a tool that will definitively solve the problems of teaching mathematics, as well as Trigonometric Functions, but it is seen as a didactic strategy that mediates the teaching process.

Thus, it can be emphasized that the good development of student learning is linked both to flexibility and to innovative actions with conventional materials: blackboard, chalk, etc. Adhering to the use of *educational software* in mathematics classes can be a good alternative of diversified methodology. However, it is emphasized again that this practice is not enough for the student to learn, it is necessary for the student-teacher interaction, as well as the constant updating of the educator to the use of new technologies applied to mathematics.

The software chosen for this research was *Geogebra. Free educational software* , of Dynamic Geometry, created in 2001, at the American University Florida Atlantic, by Markus Hohenwarter, to be used in the classroom. With this computational resource, it is possible to work on the teaching of Mathematics from Elementary School to Higher Education. According to Persicano (2013), it is a program that is easily accessible and continuously updated.

With *Geogebra*, Bittencourt (2012) points out, it is possible to work with Algebra, Geometry and Calculus. Constructions can be made with points, vectors, segments, lines and conic sections, as well as functions; You can also modify these entities dynamically. On the other hand, equations and coordinates can be entered directly.

The *Geogebra* interface features an algebraic window and a graphical window, in which the Geometry tools can be operated by means of the mouse to create geometric constructions on the

sketchpad. Silva and Penteado (2013) state that the program has two working windows: geometric and algebra. The geometric window is the place where the objects are constructed. In it, it is possible to color figures, increase the thickness of lines, measure angles and distances, enable Cartesian coordinates, polar coordinates, etc. In the Algebra window, you can view the algebraic representation of every constructed object. This double representation of objects is the most notable feature that the program has.

Finally, among the various uses of *Geogebra* , it can be highlighted that in the teaching of trigonometric functions, specifically: sine and cosine, it allows a better visualization and dynamism in the work with such content, especially when there is variation of its parameters. Thus, this computational resource provides students and teachers with another environment in which learning can be stimulated, through the union of computer resources directed to the teaching of mathematics.

METHODOLOGY

The research has a quantitative-qualitative character, in this approach there is an organization of the data so that the researcher can make decisions and draw conclusions from them. According to Terence and Filho (2006), this approach is concerned with measuring quantity, frequency and intensity; and analyzing the causal relationships between the variables that were applied in the treatment of the questionnaires, where the students were accounted for, their interest in mathematics, use of information technology, etc.

Subsequently, the qualitative approach was used, where Gil (2002) assures that it is an organization of the data in such a way that the researcher can make decisions and draw conclusions from them. In view of the measurement of the students' profile, the results obtained were compared with the proposed sequence, and thus, the results of the research involved were obtained.

The modality was action research. In action research, in addition to understanding, it aims to intervene in the situation. Researchers and participants are involved in a cooperative and participatory way.

According to Fiorentine and Lorenzato (2009), in action research, the researcher inserts himself in the environment to be analyzed in order to study it, understand it and, above all, change it in the direction of improving practices.

The research was carried out at IFNMG – Salinas Campus. The classes chosen to carry out the research are two, of the six, from the 2nd year of High School. These classes were chosen because they were in the classes in which the research professor taught his classes.

In the research, trigonometry activities were developed. In class – Class A: 26 students – developed using the *Geogebra software* as a tool to improve visualization and understand variations and in the other – Class B: 35 students – worked in a traditional way: using pencil, eraser, ruler,

calculator, etc. It is noteworthy that, before developing the work in the two classes, the content proposed in this research was worked in a traditional way, at the same time and using the same methodology. After this development, the activities were applied and worked on in different ways to evaluate the results.

For Class A, a Geogebra mini-course was held in which the students were presented with the program as a whole and specifically the resources that would be used in the activities.

After this introduction of the *software*, activities involving the construction of the trigonometric circle were developed, exploring: its concepts, the location of sine and cosine and the sketch of the graphs of these functions. Subsequently, activities were developed involving the variations of the parameters in the functions, studying the image, period and domain in each case. The activities were developed by the two classes, remembering that they were adapted for Class B, without *Geogebra*.

ANALYSIS OF RESULTS

ANALYSIS OF ACTIVITIES CARRIED OUT WITH GEOGEBRA

Before the beginning of the activities, for class A that developed the activities with *Geogebra*, a mini-course was held with a duration of 2 hours/classes on *Geogebra* showing the windows and the main tools that would be used in the activities in a computer lab at IFNMG – Salinas Campus. It was noted that the first contact aroused the curiosity of the students for the *Software*, since they identified the dynamism that the use of *Geogebra* provides.

ACTIVITY 1 – CONSTRUCTION OF THE TRIGONOMETRIC CYCLE

The first activity carried out by Class A aimed at the construction and identification of the values of the Sine and Cosine Functions in the Trigonometric Cycle built in the *software*. According to the objectives, Bicudo and Borba (2009) emphasize that the software's potential is manifested by the enormous capacity for numerical and graphical calculation, as well as the use of tools to move freely and coordinate representations. In this aspect, the visual representations of *Geogebra* highlight these resources.

One difficulty perceived in the class was the reading of sine and cosine. It took some time for them to understand that the cosine points were located on the x-axis and the sine points on the y-axis. Emphasizing, therefore, the lack of assimilation to the concepts of axis location in the Cartesian Plan. As also addressed by the curricula in Brazil (2006), the elaboration of a graph by means of the simple transcription of data taken in a numerical table does not allow us to advance in the understanding of the behavior of the functions; Thus, the need for a study of the representations must be associated with their behavior.

This activity was performed in one hour/class, by the researched class, and all students were able to achieve the objectives.

ACTIVITY 2 – CONSTRUCTION AND RECOGNITION OF GRAPHS OF SINE AND COSINE FUNCTIONS

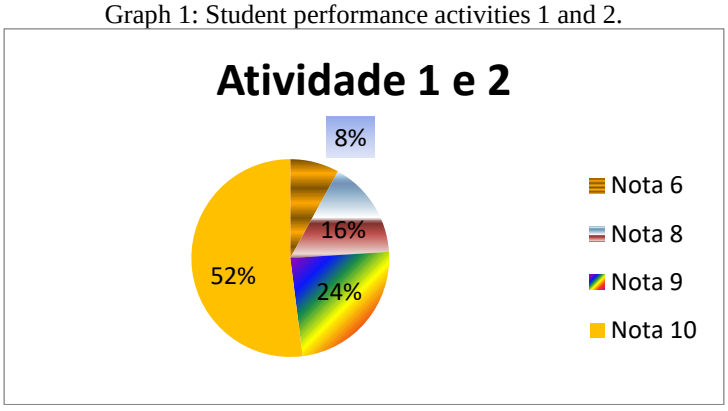
Activity 02 aimed to read the values of the notable arcs from 0 to 360° for sine and cosine; and to fill in the tables with subsequent construction of the graphs of the functions sine, (3),$f(x) = senx$ and cosine, (4),$f(x) = cosx$ from the tables.

One of the doubts arose when moving the point on the circle, because the values found were not exact and so they judged it wrong since they could not locate the points exactly. Brazil (2006) argues that, at this stage of its formation, the development of the ability to estimate the order of magnitude of calculation results or measurements and the ability to deal with exact or approximate numerical values according to the situation and the available instruments, which in this case was requested to approximate as much as possible the exact value.

Activity 02 was performed in one hour/class, and only one of the students did not complete in the mentioned time. It is important to note that the students were able to achieve the objectives of these activities and that they were very enthusiastic about the use of Geogebra for Mathematics activities.

To quantitatively evaluate the activities, it was scored as follows: assembly of the cycle in Geogebra 2 points, reading and assembly of the tables 1 point for each and the graphs were evaluated in 3 points each, totaling 10 points. The performance of the class is shown in Graph 1.

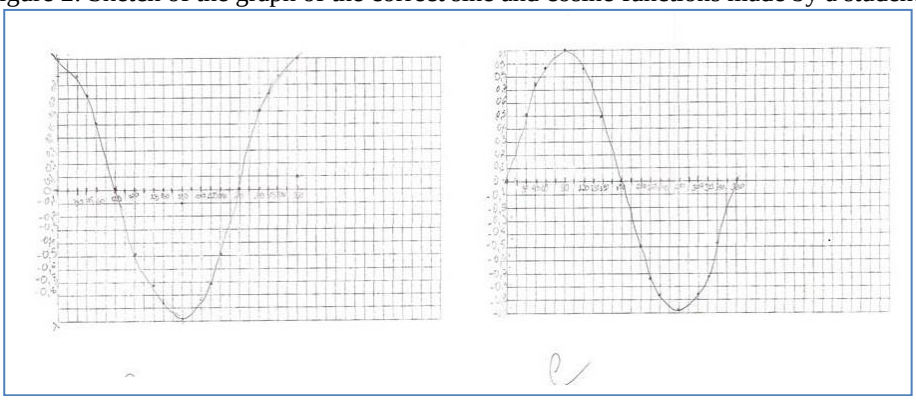
Graph 1: Student performance activities 1 and 2.



Source: Activity 1 and 2 Research

Most of the students achieved the highest grade, as shown in Figure 2. Highlighting the correct chart sketches made by students in the class.

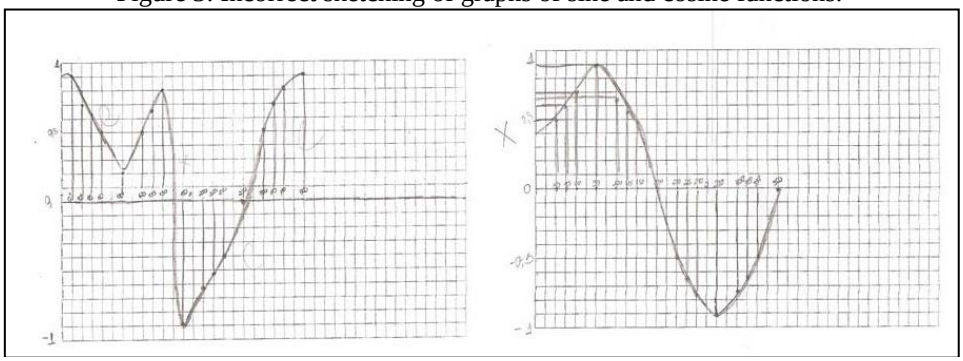
Figure 2: Sketch of the graph of the correct sine and cosine functions made by a student.



Source: Activities 1 and 2 research

Of the students who achieved the lowest score, it was observed that their graphs were incomplete, with incorrect location of the points, and errors in the signs in the table that caused the error of the graphic design. As shown in figure 3.

Figure 3: Incorrect sketching of graphs of sine and cosine functions.



Source: Activities 1 and 2 research

Despite the errors observed, the result of this activity was very good. The students were able to achieve the objectives of the activity, in addition to completing it in the proposed time, being a positive point in the evaluation of the use of the *Software.* The students analyzed *Geogebra* as an adequate alternative to obtain the different representations, which gave them ease, speed and rigor.

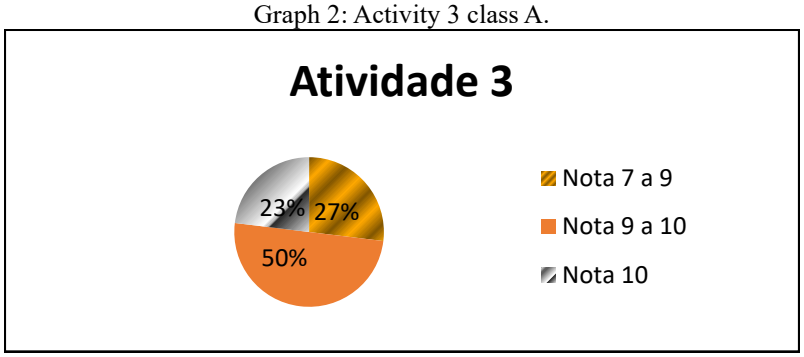
ACTIVITY 3 – IDENTIFICATION OF THE DOMAIN AND IMAGE OF THE FUNCTIONS

The activity had the participation of 26 students, and the objective in this stage was to build several graphs of the Sine and Cosine function; and observe variations in image, period, and function domain through the *Software*. This activity was subdivided into Task I, to construct the graphs of the Sine Function with its variations, and in Task II, to construct the graphs of the Cosine Function with its variations.

The activity was evaluated in 10 points, with 0.5 points for each function, totaling 10 points for the Sine in Task I and 10 points for the Cosine in Task II.

Graph 2 shows the good rate of correct answers obtained in this activity. It is important to highlight the excellent participation of the students, all of them developed the activity showing great interest. In the first answers there were some questions, but then the vast majority did everything right, which is represented in the graph below.

Graph 2: Activity 3 class A.



Source: Activities 3 Survey

To complete this activity, it was necessary 01 hour/class in the researched class. All students achieved the goal of the activity. It was also observed that the students were able to identify the Domain, the Image and the Period of the Functions.

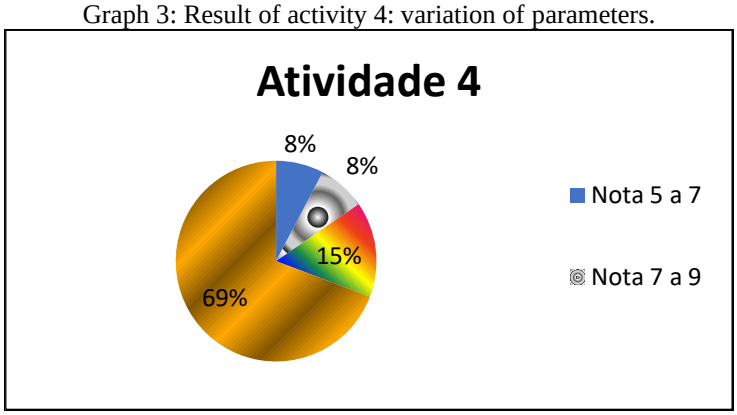
ACTIVITY 4 – VARIATION OF PARAMETERS A, B, C AND D IN THE SINE FUNCTION

The last activity of this class, which was developed with the help of *Geogebra*, aimed to investigate the effects of changes in parameters a, b, c and d on the function (5). After assembling the graph using the variation of the parameters in Geogebra, four open questions were proposed to analyze the behavior of the graph of the given function, through the variation of the elements a, b, c and d. The activity was developed by the 26 students who completed it in one hour/class. $f(x) = [a * \sin(b * x + c)] + d$

It was scored 10 points, with 2.5 points for each question. In these exercises, the goal was for students to describe the behavior of the function graph at each variation of a parameter, observing what changes occurred during the variation, generalizing the behaviors.

In Graph 3, we can see the large number of students who were able to identify the behavior by varying the parameters. As such, these results made it possible to identify how much the students participated positively in the activities. They didn't worry about simply finishing the activity, but about getting the chart variations right. This affirms what is proposed in Brazil (2000), that the study of Trigonometric Functions is linked to applications, avoiding excessive investment in the algebraic calculation of identities and equations to emphasize important aspects such as analysis of the behavior of their graphs.

Graph 3: Result of activity 4: variation of parameters.



Source: Activity 4 Survey

At the end of the activities with *Geogebra,* it was observed that the entire activity had a positive result using the *Software* and the students showed satisfaction with this methodology and reported that they were able to perceive certain situations that in the traditional method they would not notice, especially the variations. In order to compare the use of Geogebra and the traditional methods of teaching Trigonometric Functions, these same activities were adapted and applied in Class B without the aid of *Geogebra,* whose results will be shown below.

ANALYSIS OF ACTIVITIES PERFORMED WITHOUT GEOGEBRA

In Class B, the activities were carried out using only pencils, erasers, rulers and paper. The following is an analysis of the activities applied in this class.

ACTIVITIES 1 AND 2 – CONSTRUCTIONS OF THE GRAPH AND TRIGONOMETRIC CYCLE OF SINE AND COSINE

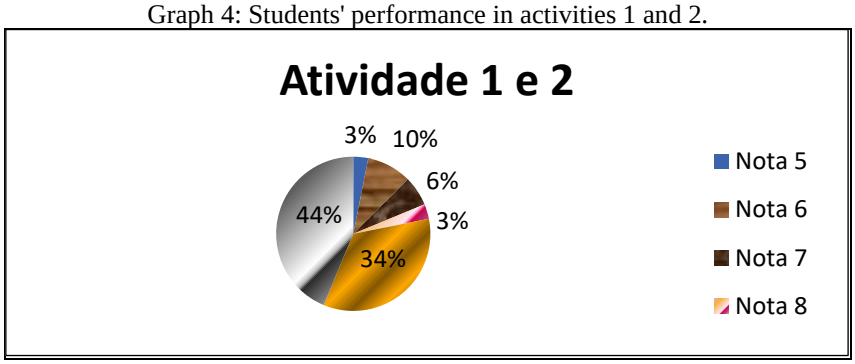
Activities 1 and 2 aimed at the construction of the Trigonometric Cycles with the values of the Sine and the Cosine, with subsequent filling of the tables through the values observed in the Cycles and representations of the functions in the Cartesian plane. To evaluate the activities, it was scored as follows: assembly of the cycle 2 points, reading and assembly of the tables 1 point for each and the graphs were evaluated at 2 points each, totaling 10 points.

It was noticed during the activities that the students in this class could not locate the points, so they were stuck with the need to use formulas and tables to locate the sine. They also exposed difficulties in identifying the signs of the positive and negative functions. Regarding the difficulties presented, Neto (2010) states that the student, when starting his study about the trigonometric circle, is faced with several novelties around the angle: the radian, the irrational π, the definition of radians and their transformations, which constitute obstacles to be faced by educators and students.

In the sketch of the graphs, it was observed that most of the students did not perceive the issue of the ranges of values in the x and y axes, which caused errors in the sketch of the graphs of the functions.

The analysis is presented in Chart 4. Many students were able to get all the questions right, which was expected for this activity. It was observed that there was a higher number of students with lower grades and who did not complete the activities. The need for the construction of graphs is highlighted in the national curricula, where in Brazil (2006) it concerns that students should have the opportunity to draw graphs referring to trigonometric functions, when writing , usually the variable x corresponds to the measure of arc of the circle taken in radians.$f(x) = senx$

Graph 4: Students' performance in activities 1 and 2.



Source: Activities 1 and 2 research

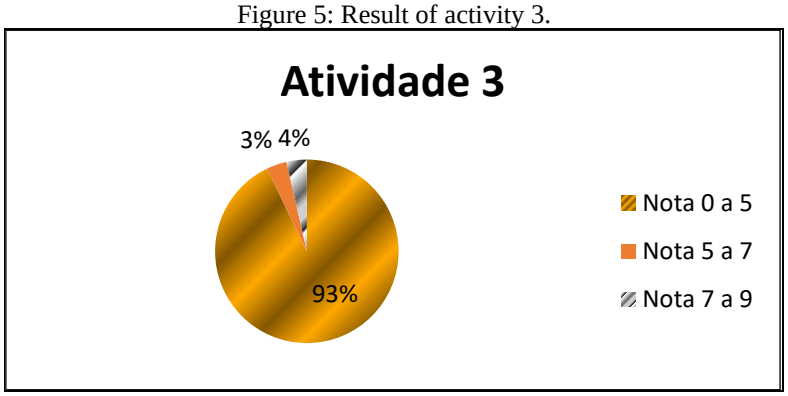
Another issue that drew attention in carrying out the activity was the time spent in the execution, about two hours/class. It is worth mentioning that many students complained about how difficult the activities were and showed less interest than the other class.

ACTIVITY 3 – IDENTIFICATION OF THE DOMAIN, IMAGE AND PERIOD OF THE FUNCTIONS

The activity had the participation of 28 students and aimed to build the graphs of the sine and cosine functions and observe the variations of the image, the period and the domain of the function through the drawings. As in activity 03 with *Geogebra*, it was subdivided into Task I for the Sine function and Task II for the Cosine function. This was evaluated in 10 points, which were evenly distributed for each function, which totaled 5 for the Sine in Task I and 5 for the Cosine in Task II.

Graph 5 shows the score achieved by the students in the activity. As can be seen, the students did not obtain the same results as the classes with *Geogebra*. No one reached the total number of correct answers and almost all students did not get even half of the activity right. The students complained about the excessive use of formulas and tables to be able to draw the graphs and analyze the questions asked.

Figure 5: Result of activity 3.

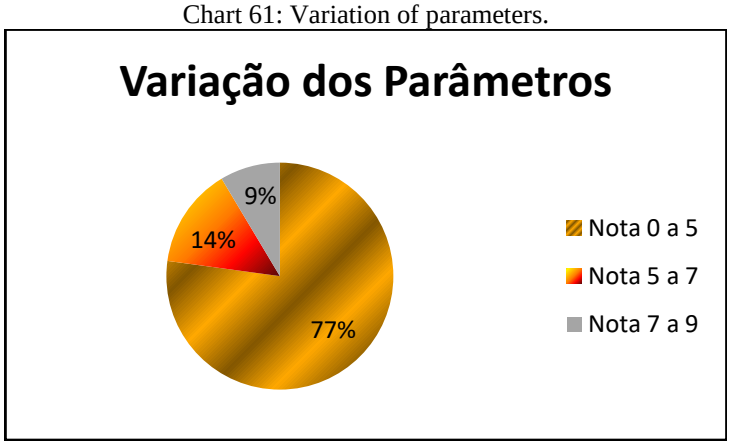


Source: Activity 3 Research

ACTIVITY 3 – VARIATION OF PARAMETERS A, B, C AND D IN SINE AND COSINE FUNCTIONS

Also in activity 3, at the end of each variation with the completion of the tables and graphs drawn, the following was questioned: what he observes of variation in the function, according to Appendix C. These questions aimed to observe the variation of Parameters a, b and c of the Trigonometric Functions, Sine and Cosine. It was evaluated in the same way as the other class, 2.5 points per question. Graph 6 shows the performance achieved by these students, which was considerably lower than that obtained with the use of the *Software*. None of the students were able to get these questions right. The fact that they are unable to visualize such variations is described by Nacarato and Santos (2004), who point out that it is impossible to teach trigonometry without visual aids. But these can't just be static, as with drawing.

Chart 61: Variation of parameters.



Source: Activity 3 Research

By analyzing the execution of the activities in the two classes, using *Geogebra or not*, it was possible to verify that the use of the *software* facilitated the execution, visualization and reduced the time of application of the same activities, since all students were able to complete the activities and obtained a good rate of correct answers, already in the class without the *software*. No one was able to get the whole activity 03 right. As noted, the sequences without *Geogebra* required more use of

formulas and tables, as well as more time for the application of the activities. Another important fact to be highlighted is that, unlike Class A, 13 of the 33 students who performed this activity did not complete their work, and complained that it was very difficult and tiring.

FINAL THOUGHTS

Piva, Dorneles and Spilimbergo (2010) highlighted three positive points in their research: the ease of operation of the *software*, and the students' interest and participation in computational activities. They also pointed out that the use of *software* allows simulations, which leads students to build their own analyses and conclusions and, for these reasons, they defend the use of computerized environments in the teaching and learning process of Mathematics.

The need for the use of differentiated methodologies is an important instrument to be studied by us Mathematics teachers and educational institutions. It is pertinent for schools to reflect on this need to adopt diversified methods that arouse the attention and interest of students, such as *educational software*. From this perspective, *Geogebra* was evaluated as an instrument to assist the teaching-learning of Trigonometric Functions, Sine and Cosine.

We can highlight that the *software* can help us in the teaching of trigonometry by assisting in graphic visualization, in understanding the variations in functions, in the interest in working with this discipline and also in the participation of the class in classes.

These statements can be proven in the comparison of the activities developed by the classes, one with the help of the *software* and the other without the tool, when developing the same activities, these were simply adapted to the two situations.

Thus, we can affirm that we were able to answer the questions of this research by finding several contributions of *Geogebra* in the teaching of Sine and Cosine Functions – as we have already emphasized: interest, participation and performance – and we show an alternative of how to use the tools in the program that numerically, in this sample studied, was shown to be efficient in learning the content addressed.

The handling of this *software* allows in a simplified way to vary the functions and make various observations and corrections in drawings, graphs and formulas, enabling the resolution of activities more quickly, reducing the time of application of the content, favoring the fulfillment of the curricular matrix of Teaching.

As for the objectives of this research, it was noticed that when developing the activities with and without *Geogebra,* the *software* is a facilitating means in the teaching-learning process and seen as something interesting and motivating by the students, mainly because it promotes a better visualization of the Functions.

Finally, it is important to ratify that the use of new methodologies is not the act of solving the problems that involve the teaching of Mathematics. And yes, something that must be constantly reflected on by the school and teachers, as a way to achieve the main objective: student learning.

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Curriculum and ethnic-racial relations: The production of the *humanized subject* in a confessional school in Belo Horizonte

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ABSTRACT

In post-critical educational theorizing, the curriculum, as a heterogeneous unit in which various worldviews compete for space, can be understood as an instrument of government, to the extent that, inserted in an intricate network of power-knowledge relations, it mobilizes techniques and strategies in order to produce a subject desired by it. In the curriculum investigated in this work – namely, the History curriculum of the 1st year of High School of a private confessional school in the city of Belo Horizonte, Minas Gerais – I argue that, through a device of raciality, in the "Colégio Machado de Assis" (fictitious name) the production of a "humanized subject" is operationalized from extracurricular activities whose main focus is the development of charity in students. At the same time, during school hours, the focus should be on content to be used in the performance of tests and exams for admission to higher education. In this process, ethnic-racial relations, understood as power-knowledge relations mobilized by the concepts of race and ethnicity that occur at all times among all racialized subjects, including those who do not assume their own racialities, are experienced at school without, however, being problematized, making the notion that charity is intertwined with the problems arising only from the idea of social class emerge in the discourse. but it distances itself from the notions of race and ethnicity as important elements in the subordination of certain groups. To this end, I use as a theoretical-methodological approach the post-critical perspective in education and curriculum, mainly from Foucauldian studies, in order to produce a strategic bricolage of four methodological procedures: digital ethnography, in the accompaniment of Helena's online History classes (fictitious name); semi-structured online interviews with coordination, faculty and students, and; "academic dates", i.e., discussion groups on some topics related to the concepts of race and ethnicity held periodically with the seventeen students participating in the research and; analysis of the Foucauldian-inspired discourse, based on the school's website and the information produced collectively in the research. The results showed that, being a school whose vast majority of the public identifies and is socially read as white, the power-knowledge relations operationalized in the curriculum of the "Colégio Machado de Assis" aim at the constitution of a subject, capable of solidarizing and being charitable towards those "less favored" without, however, promoting the questioning of the ethnic-racial issue as a relevant element for the maintenance of the asymmetry of these relations. Thus, although in the discursive field, there is an interest in the treatment of the ethnic-racial issue, it was possible to perceive that the curricular practices analyzed are relegating the discussion of ethnic-racial relations to a second plan, even if the students' own experience causes tensions in the curriculum.

Keywords: Curriculum, Ethnic-corrhracic relations, Power-knowledge relations.

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INTRODUCTION

> To the vanquished, hatred or compassion; to the winner, the potatoes.
> (MACHADO DE ASSIS, Joaquim Maria. Quincas Borba. 1891)

The quotation that opens this text summarizes the theory of Humanitism, created by Quincas Borba, a character by Machado de Assis, in the book of the same name. The character proposes that, if there is a field of potatoes and two hungry tribes, if they share the potatoes, in the end, neither of them would be able to cross the boundaries that would take them to another place with an abundance of potatoes, both succumbing to starvation. However, according to the principle of Humanitism, the desirable solution would be war, as the extermination of one of the tribes would be the fundamental factor for the survival of the other (MACHADO DE ASSIS, 2019).

Published for the first time in 1891, Machado de Assis's text, which criticized monist theories of the late nineteenth century, invites us, even today, to a critique of the society in which we live. When we take as the object of this discussion, the ethnic-racial relations that we experience on a daily basis, it seems to us an easy task to produce an analogy with the Machadian text. Although the problem of ethnic-racial relations in Brazil has acquired, over the years, new garments and production dynamics, the core of the issue has remained the same: the asymmetry of relations between those who are read and read socially as white people and those who are read and read themselves as non-white people.

Even today, there are countless episodes of racism that we witness, see reported in newspapers, social networks and carry in our memory. How can we not remember João Alberto Silveira Freitas[3], who was punched to death in a supermarket on the eve of the "Day of Black Consciousness"; or, even more recently, the murder of 24-year-old Moise Kabagambe, who, after asking his boss for a two-day's wage, was beaten to death by five men in front of the kiosk where he worked[4]? Lives that, as in so many other cases, were brutally taken, under the same sign: the black color of their skin.

In schools, the tensions caused by the power-knowledge relations constituted in the curriculum with ethnic-racial relations also mark the students' bodies physically and symbolically. In the curriculum of Colégio Machado de Assis – a confessional school in Belo Horizonte, where the research was carried out, in which the vast majority of students identify and are identified as white people – these relationships also provoke a series of conflicts between students and between them and the school's management team.

[3] Available at: <https://g1.globo.com/rs/rio-grande-do-sul/noticia/2020/11/20/homem-negro-e-espancado-ate-a-morte-em-supermercado-do-grupo-carrefour-em-porto-alegre.ghtml> Last accessed on: February 13, 2022.
[4] Available at: <https://www.assufrgs.org.br/2022/02/01/moise-kabagambe-espancado-ate-a-morte-apos-cobrar-o-seu-salario/>. Last accessed on: February 13, 2022.

Amanda, who identifies herself as a 15-year-old black student in the 1st year of high school, says that, at Colégio Machado de Assis, the feeling that permeates her is that at school, "people are very little informed about this and (...) the relationships between people with the small number of black or brown people, or any other ethnicity that they have at school, [happen through] some comments, well, like, racist, well veiled" (Interview conducted on 06/10/2021), then reporting a series of moments in which she suffered from racist attitudes coming from her classmates; or, on another scale, as Helena, a 38-year-old white woman, a History teacher in the 1st grade classes, tells us: "At school it's like this: is there a more controversial job? [People are already commenting] "I bet this is Helena's thing" (Interview conducted on 07/28/2021), because, according to the teacher herself, she is one of the few high school teachers who gives visibility to the theme of ethnic-racial relations in her curriculum.

In view of these reports and understanding that the curriculum is a "social construction" (SILVA, 2015, p. 148) and, therefore, should not be understood "neither as a certain unit, nor as a homogeneous unit, but as a historical, political unit and the result of interpretations" (CORAZZA, 2001, p. 132), it is possible to perceive that a field of constant dispute is established around the contents to be taught or not, of the worldviews that one wishes or does not wish to perpetuate, mobilizing techniques and strategies in order to produce, through a "selection" (SILVA, 2015, p. 15) a desired subject.

At Colégio Machado de Assis, the public served belongs mostly to the middle and upper classes – as teachers and students tell us – and, in that environment, one can be "sure that the world is white" (Helena, interview conducted on 07/02/2021), since the number of black students is extremely small in relation to the number of white students. Returning, then, to Quincas Borba's hypothesis, it becomes possible to conjecture, based on the interviews conducted, that the access of black people to places previously occupied only by white people, generates in a good part of the student and in their families, the feeling that "you are closer to the working class, lower, than to the rich" (Helena, interview conducted on 07/02/2021) bringing dread, because the new power-knowledge relations that are being constituted in this process point out that "you are not that rich, that you are not that exclusive" (Helena, interview held on 07/02/2021), and it is therefore necessary, by the analogy proposed here, that for one "tribe" to survive the other it has to be "eliminated".

Understanding ethnic-racial relations, not only as a syllabus to be inserted in the curriculum, but as the relationship between bodies, thoughts, ways of understanding life and effectively living it, they come to be understood as power-knowledge relations mobilized by the concepts of race and ethnicity that happen at all times among all racialized subjects. even for those who do not assume their own raciality.

We argue that it operates in the curriculum with ethnic-racial relations of Colégio Machado de Assis, a *device of raciality-ethnicity* that produces and reproduces these asymmetries of power-knowledge relations, through the constitution of a *humanized subject* – who is capable of doing charity without, however, appropriating the discussions about the ethnic-racial relations that he lives.

To this end, we use the post-critical perspective in research in education and curriculum, building a "contact methodology" for the analysis of the information produced in partnership with the research participants. In this methodology, we sought to mix theories, concepts and procedures so that we could find instruments capable of helping us to follow the paths of research.

Based on these premises, we present in the following topics, the concept *of raciality-ethnicity device* and its desired subject – the *racially inert subject* – as well as the remodeling of this subject in the curriculum of Colégio Machado de Assis, which is now understood as *a humanized subject*, bringing, finally, some considerations that we consider important in the research process.

THE EMERGENCE OF THE *RACIALITY-ETHNICITY DEVICE* AND THE PRACTICES OF GOVERNMENT FOR THE CONSTITUTION OF THE *RACIALLY INERT SUBJECT*

According to Michel Foucault, the device is "a decidedly heterogeneous set that encompasses discourses, institutions, architectural organizations, regulatory decisions, laws, administrative measures, scientific statements (...) In short, what is said and what is not said" (FOUCAULT, 2016, p. 364) which, put into operation by a network of relationships, seek to "respond to an urgency" (FOUCAULT, 2016, p. 365) of a "certain historical moment" (FOUCAULT, 2016, p. 365).

In addition to this "strategic function" (FOUCAULT, 2016, p. 365), another fundamental characteristic, pointed out by Foucault, is that the device undergoes a process of perpetual strategic fulfillment" (FOUCAULT, 2016, p. 365), that is, in the face of the urgency that arises, the device, as a material operator of power (REVEL, 2005), needs to adapt, reformulate itself, produce remodels capable of containing the contingencies and questions that are made of them.

The device, "always inscribed in a power game, [is] always (...) linked to one or more configurations of knowledge that are born from it but that also condition it" (FOUCAULT, 2016, p. 367), thus instituting and operationalizing concrete practices of governing conducts, in order to produce a specific configuration between knowledge and power for the immanence of its desired subject (WEINMANN, 2006), whose constitution depends on the exercise of power "operating on the field of possibility where the behavior of active subjects is inscribed" (FOUCAULT, 1995, p. 243), so that he is able to "'conduct conduct' and order probability (...) structuring the eventual field of action of others" (FOUCAULT, 1995, p. 244).

In the constitution and emergence of the *raciality-ethnicity device*, the ethnic-racial dimension becomes central to the extent that, through it, a truth about Brazilian bodies is shaped in

society since the beginning of colonization. The black body that is produced in this device is not constituted as a racial reference to be reached, but rather so that the white body can say what it is not (FOUCAULT, 1978): it is not violent, it is not ugly, it is not bad, it is not poor... because he is not black (FANON, 2008, MBEMBE, 2018).

In this regard, Sueli Carneiro, in her thesis entitled "The construction of the other as non-being as the foundation of being" (2005) addresses the constitution of a device of raciality, constituted in Brazil since the arrival of the Portuguese in the sixteenth century. 2005, p. 42), instituting a constant inferiorization of all those read as non-white.

However, if the production of the Other, as stated by Carneiro (2005), is done in terms of inferiority, based on Michel Foucault, we can affirm that, although the power-knowledge relations produced by this device demonstrate a strong asymmetry in the exercise of power, the black body and the white body should be understood as complementary forces that intersect and mutually produce each other. since "when one racializes another, one is at the same time racializing oneself" (GUIMARÃES, 2016, p. 165), that is, when saying of the other, by classifying him/her and hierarchizing his/her existence, the one who names him/her, also says of him/herself, both to distance oneself and to get closer to the figure he/she analyzes.

Between displacements and accommodations, the device of raciality was maintained for centuries, as it benefited from the various representations of the black body (CARNEIRO, 2005), based on power-knowledge relations that enabled the racialization of all those who were considered non-white.

Historically, it is possible to find the first mobilizations and operationalizations in the 1930s, with their intensification from the 1940s onwards, when the relations of power-knowledge about race tensioned the knowledge produced in the scientific-biological field, but in the social, political and economic fields, the asymmetries remained. At this moment, then, the concept of ethnicity began to be mobilized more strongly among academic, political, legal and social circles, providing that "'under the cover of race' cultural considerations were introduced, to the extent that beliefs and values were associated with the notion" (SCHWARCZ, 2012, p. 33). As a result, a new remodeling of the raciality device was necessary, since the concept of race was no longer able to maintain the stability of the device, thus enabling the emergence of what we call the *raciality-ethnicity device* – a device that does not abandon the historicity of the concept of race, but that is not restricted to body marks. also taking the cultural issue as an important instrument in our power-knowledge relations.

Thus, when "social practices can engender domains of knowledge that not only make new objects appear (...), but also give birth to totally new forms of subjects" (FOUCAULT, 2013, p. 18), the *device of raciality-ethnicity*, in order to govern the behaviors of its population, starts to activate some practices, namely: the *myth of racial democracy*; the *becoming-black of the world*; whiteness

and; the *racism*. Through these practices, it is then able to achieve its objective in the production of continuous practices of racialization of the Other – here understood as all those considered non-white – and the maintenance of the asymmetry of these power-knowledge relations.

In this way, the practice of the *myth of racial democracy* [5]is constituted as an innovation of the *raciality-ethnicity device*, justified by the idea of the miscegenation of people, and that, being a multicultural society, everyone would bear the marks of miscegenation (SCHWARCZ, 2001). Triggering a feeling of tolerance, but not of respect, among citizens, the idea of racial democracy "allowed [then] to naturalize social, political and cultural differences" (SCHWARCZ, 2001, p. 26), without, however, promoting changes in the device.

Another practice constituted by the *raciality-ethnicity device* consists in the practice of *whiteness*. Defined by Lourenço Cardoso as "an ideological construct, in which whites see themselves and classify non-whites from their point of view" (CARDOSO, 2017, p. 27), whiteness would be a "racially marked identity, [in which] the white individual is given the [exclusive] power to highlight it or not" (CARDOSO, 2017, p. 30) according to his own interest. In this sense, whiteness, understood here as this socio-historical construct of maintaining asymmetries in ethnic-racial relations, could allow the white body to benefit from a series of racial privileges while publicly positioning itself in favor of the end of racism. In this regard, Roger Bastide and Florestan Fernandes have already pointed out, in the book "Whites and Blacks in São Paulo" (1955) that there is a prejudice in Brazil in saying that one is prejudiced in the public sphere, even if in the private sphere, discrimination remains.

The third practice operationalized in the *device of raciality-ethnicity* is here called the practice of the *"becoming-black of the world"*.[6] Understood as a practice focused not only on the marks of color, but mainly by and mainly by the cultural notion brought by the concept of ethnicity to the device, this practice activates and makes work a series of procedures to insert oneself in the most diverse environments, reaching not only those considered non-white by the criterion of race, but all those groups and individuals who are seen as liable to suffer "predations of all kinds". the species [and/or] destitution of any possibility of self-determination" (MBEMBE, 2018, p. 20) such as, for example, women, the LGBTQ+ community, the poor, gypsies, among others, without ever ceasing to affect the black population.

Racism appears, then, as the fourth practice instituted by the *raciality-ethnicity device*. Far from ignoring the fact that the practice of racism did not emerge in the twentieth century, the

[5] "Racial democracy" would be a state in which there would be full legal, political, and social equality among individuals, regardless of their race. (FREYRE, 1933; FERNANDES, 1965; BASTIDES and FERNANDES, 2013; RIBEIRO, 2014)
[6] In the book "The Critique of Black Reason" (2013), Achille Mbembe defines the "becoming-black of the world" as a "characteristic of the potential fusion between capitalism and animism, (...) [in which] the noun negro ceases to refer only to the condition attributed to peoples of African origin during the time of the first capitalism" (MBEMBE, 2018, p. 19-20).

procedures used from the *raciality-ethnicity device* give *racism* another field of action. Understood as a "fundamental mechanism of power" (FOUCAULT, 2010, p. 214), it is inserted in the discourse of power as "a way of lagging, within the population, some groups in relation to others" (FOUCALT, 2013, p. 214). Thus, from the point of view of the State, "racism will allow me to establish, between my life and the death of the other, a relationship that is not a military and warlike relationship of confrontation, but a relationship of the biological [and cultural] type" (FOUCAULT, 2010, p. 215), while in the microphysical sphere of power, it can be understood as a practice that triggers these procedures of distinction between one and the other in order to create a truth about the subject to be produced by the device.

In this regard, Munanga (2003) argues that "the difficult thing is to annihilate fictitious races that surround our collective representations and imaginaries" (MUNANGA, 2003, n.e.), because, while "classical racism feeds on the notion of race, new racism feeds on the notion of ethnicity defined as a cultural group, a category that constitutes a more acceptable lexicon than race" (MUNANGA, 2003, n.d.). Through *racism*, then, the *device of raciality-ethnicity* seeks to proliferate a truth about ethnic-racial relations, while using symbolic violence to conform dissident bodies and, in cases where this conformation is not possible, physical violence, as a last resort, since through it, the extermination of the other comes to be seen as a way of safeguarding the truth of that society (FOUCAULT, 2010).

In the functioning of the *raciality-ethnicity device*, the four practices presented here operate and mix in the constant production of a racialized other, allowing the maintenance and functioning of the device, while conforming "historical and social determinations" (FERNANDES, 2012, p. 77) to make the *racially inert subject appear*.

Inserted in the machinery of power, there is in the *racially inert subject*, a specificity in its field of action, which is the very production of inertia in ethnic-racial power-knowledge relations. In another analogy, we recall the first law of Newtonian mechanics that says "[t]he body continues in its state of rest or of uniform motion in a straight line, unless it is forced to change that state by forces imprinted on it" (NEWTON, 2016, p. 52). In view of this formulation, the *racially inert subject* produces his existence in *the raciality-ethnicity device* based on three possibilities: "at rest" or in an apathetic way; "in uniform rectilinear motion" or in a cordial manner; "by imprinted forces" or by resistance.

We see apathy as the first possibility of action of this subject, which, inspired by the Stoic concept as a state in which there is "indifference to everything that happens" (AMORIM, 2018, p. 62), works as an operationalized technique in order to produce a lack of knowledge about any point concerning the theme of ethnic-racial relations, protecting oneself from questioning through the

stigma that this would be someone else's responsibility, which commonly emerges as being the State "unilaterally criminal[s]... [becoming] the origin of all evil and corruption" (SOUZA, 2021, p. 241).

The second possibility for the *racially inert subject* would be in the "uniform rectilinear movement", which would trigger techniques so that nothing is modified in the device. Thus, he uses cordiality, described by Sérgio Buarque de Holanda (1936), as "hospitality, generosity, virtues so vaunted by the foreigners who visit us, [and which] represent, in fact, a defined trait of the Brazilian character" (HOLANDA, 2014, p. 176). Returning to the proposed analogy, we understand that the operationalization of cordiality in ethnic-racial power-knowledge relations aims, then, to keep the "speed" of the device always the same, allowing us to have the sensation of movement, when in reality, we remain in a state of inertia, constantly reproducing the same actions.

Recalling the Foucauldian maxim that "where there is power there is resistance" (FOUCAULT, 2019, p. 104), the third and last possibility presented refers to the "forces imprinted" on the *raciality-ethnicity device*, as a form of resistance to its functioning, making possible the existence of fissures in the constant process of accommodation and relocation of the device, such as the action of black social movements, that continuously question the practices and relations of power-knowledge produced and activated in the *device of raciality-ethnicity*.

In this sense, in the production of the *racially inert subject,* we see the bases that enable the emergence of the *humanized subject* in the curriculum with ethnic-racial relations of the Colégio Machado de Assis, a subject who, inserted in the power-knowledge relations of the *raciality-ethnicity device,* questions the school's curriculum and creates other possibilities for the "constitution of other ways of life" (PARAÍSO, 2010, p. 588), which may or may not create significant instabilities in the device. From here, we present, then, this remodeling of the *raciality-ethnicity device* in the curriculum with ethnic-racial relations of Colégio Machado de Assis.

THE *HUMANIZED SUBJECT* PRODUCED IN THE CURRICULUM WITH ETHNIC-RACIAL RELATIONS OF COLÉGIO MACHADO DE ASSIS

Deleuze, in the text "What is a device" (1996), states that "[t]he device has its regime of light, [and by] the way in which it falls, vanishes, diffuses by distributing the visible and the invisible, [makes] the object that does not exist without it to be born or disappear" (DELEUZE, 1996, n.d.). In these regimes, their elements intersect, question each other, come into contact with other devices, and produce instabilities that enable a series of practices and mechanisms to be activated by the device.

At Colégio Machado de Assis, a confessional school in Belo Horizonte, which serves from the first years of Early Childhood Education to the end of High School, the *device of raciality-ethnicity,* put into operation in the curriculum with ethnic-racial relations, finds in the intersections and instabilities that are produced, another way of making the *racially inert* subject viable. If, for a

long time, as reported by the 17 participants of our research, the theme of ethnic-racial relations was not frequently made visible in the curriculum, according to their points of view, with the increase in the access of "non-white" people in the school's student body, new processes of accommodation of the device were necessary, since new questions to it were emerging. Thus, the *raciality-ethnicity device* triggers yet another procedure in the curriculum of Colégio Machado de Assis, in order to continue operating. To the practices of *the becoming-black of the world*, of *the myth of racial democracy*, *whiteness* and *racism*, the practice of *charity is also added*.

Having as a basic premise of the curriculum, the understanding that everyone is a rational being and, therefore, uses their free will to choose between goodness and badness, there is a sector in the school dedicated solely to the realization of humanitarian projects based on volunteering. Charity, defined in the Caldas Aulete Dictionary as "1. An action or result of doing good to those in need; 2. Feeling and attitude of support for those in need; 3. Aid or donation in favor of people in need; ALMSGIVING" (CALDAS AULETE, 2022, s/n), is transformed into a practice of the *raciality-ethnicity device* to the extent that it promotes these extracurricular actions and projects based on the notion of the need of those who will receive the help, without considering that race and ethnicity influence this process. According to the logic presented by both Glória and the research participants, color is not a relevant factor for the choice of projects and institutions that will be served.

Glória, a white woman, pedagogical coordinator of the 1st and 2nd year classes of High School and an employee of the school for 36 years, tells us that the sector mentioned above "takes over the religious formation classes and all the projects that the school has, in order to prepare 'the boys' for the issues of respect, diversity, of care for others" (Interview conducted on 06/18/2021), through visits to nursing homes and places of care for children in need throughout the school year. It also reports that, being a sector "that takes care of the spiritual issue, the issue of the interior", students are encouraged to participate in visits and also to carry out campaigns to collect clothes and food to be destined to the institutions they choose to host, always on a voluntary basis.

Another point highlighted by Glória is that "to the extent that they do this [participate in the actions], they earn, in the end, certificates for their time of work" (Interview conducted on 06/18/2021) – an attitude initiated after a former student of the school was unable to enter a university/course abroad because he did not have certificates of extracurricular activities, while his competitor had several. Hortência, a 16-year-old white student, reports that she started to participate in these actions and in the meetings where young people discuss issues of their interest and that she has liked the proposal very much. Évora, on the other hand, questions the need for rewards for participants, which, according to her, causes "a lot of people to participate, just to show up, to win a *bottom* and a certificate" (2nd Academic Date held on 01/07/2022).

Charity, inserted in the machinery of the *raciality-ethnicity device*, makes the *racially inert subject* acquire another important element for the maintenance of the device at Colégio Machado de Assis. Through the exercise of *charity*, the intersection between "race/ethnicity" and "social class" becomes possible, causing "race and ethnicity" to disappear under "social class" through discourse. The *humanized subject* emerges, then, in the curriculum of Colégio Machado de Assis, in order to make the effects that race and ethnicity produce in social life disappear in the discursive field. Thus, through the practice of *charity*, one does not "see color, but the person" (Jane, 2nd academic Date held on July 1, 2021) and as Évora tells us, there are in the school "several cases of racism and things like that, but it is usually avoided or silenced (...) and the school usually does nothing or does little about it" (Interview conducted on 06/10/2021), since such attitudes are seen as isolated cases in the school curriculum.

Therefore, the *humanized subject* produced in the curriculum with ethnic-racial relations of Colégio Machado de Assis puts into operation the practices discussed here and is consolidated in the school's curriculum, through the practice of *charity*, which triggers cordiality and apathy in students and faculty, allowing the *raciality-ethnicity device* to continue operating between the lines of the curriculum.

... TO THE WINNER, THE POTATOES?

Returning to the book by Machado de Assis that opens this text, Quincas Borba continues his explanation to Rubião who asks him: "But the opinion of the exterminated?", to which Quincas Borba replies: "There is no exterminated. The phenomenon disappears" (MACHADO DE ASSIS, 2019, p. 18). This desire for extermination (MBEMBE, 2020a; 2020b), however, brings with it the basic principle of the destruction of the device itself, because in order for the ethnic-racial power-knowledge relations of the device to function, it is essential that the individuals involved in them are "'free subjects', while 'free'" (FOUCAULT, 1995, p. 244), that is, if the power-knowledge relations are transformed into relations of violence, The productive character of these relations ceases to exist, because violence acts, "on things; it forces, it subdues, it breaks, it destroys; (...) and if there is resistance, the only choice is to try to reduce it" (FOUCAULT, 1995, p. 243).

In order for the *raciality-ethnicity device to* remain in operation in the curriculum with ethnic-racial relations of the Machado de Assis College, extermination cannot be aspired to, because, as previously discussed, in order for the white body to be able to maintain its position in the exercise of power, the existence of the black body, this racialized other, producer and target of differentiation, it's a must. The production of the *humanized subject* intends, in this sense, the constant production of practices of racialization of the Other, for the operation and exercise of power in the ways described here. As a result, extermination, understood in Machado's text as a desirable practice for the progress

and "evolution" of society (MACHADO DE ASSIS, 2019), cannot be placed in the equation of the *raciality-ethnicity device*, as it would eliminate ethnic-racial power-knowledge relations, leaving only violence.

Se as relações étnica-raciais acquireem centralidade para o *dispositivo de racialidade-etnicidade* "Why are we afraid of the relationship with the other?" (MANGLANO, 2001, p. 46). According to Manglano, "[n]enecessitating others, and admitting it, can produce a feeling of vertigo, but it also provides a measure of what it means to live. To assume the need for the other, to know oneself mortal and not omnipotent, is part of the game of existing" (MANGLANO, 2001, p. 45-46). Ethnic-ethnic relations, understood not only as relations between blacks and blacks, but as a point of contact, between any people, women, blacks, blacks, mestizos, indigenous, etc., produce asymmetries not exercised by power, but they can also produce other ways of life, in short, "relationships, when they are true, are always disparate; to assume it is to provide spaces for the singularity of each one and for their own freedom" (MANGLANO, 2001, p. 46).

Therefore, "the exchange here is oxygen" (CÉSAIRE, 2020, p. 11), is the central principle for the device to remain in operation. The *humanized subject* aims, finally, at the constant production of the other, who must never be exterminated, because he becomes the latter, the very "oxygen" that allows the existence of the former. Thus, although the theory presented by Quincas Borba may seem to be in force in our society, it is necessary to remember that without ethnic-racial relations, there is no possibility that there will be winners; Everyone loses.

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The importance of environmental education in the 21st century: Literature review and case study

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ABSTRACT

Environmental education in secondary education is essential to train citizens who are aware of and committed to building a sustainable future. However, despite this awareness, in Brazil there are still many dilemmas around the incorporation of the subject in the BNCC. This study addresses the relevance of environmental education, highlighting the need for its integration into the school curriculum. To this end, a bibliographic review on the subject was carried out, as well as a case report of the practices carried out at the CETI Maria Adelaide Marinho Hortência, in the municipality of Careiro Castanho, Amazonas, Brazil. The educational practice revealed a significant commitment on the part of the students, who learned about sustainable practices and the importance of preserving the environment. This demonstrates the need to incorporate this type of practice into the day-to-day life of the school, as can be seen not only from our results, but also from the literature review carried out. The integration of this topic into the school curriculum, with the support of interdisciplinary approaches, is essential for the formation of responsible citizens committed to building a sustainable future.

Keywords: Environmental education, Fridays for Future, Sustainability.

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INTRODUCTION

According to the Brazilian dictionary, Education is understood as "the application of proper methods to ensure the formation and physical, intellectual and moral development of a human being" (Oxford Languages, c2024). Thus, the role of the school in always maintaining the good learning of the students becomes very important, regardless of the area in which it is spoken. Based on this principle, the 1988 Constitution guarantees that "education, a right of all and a duty of the State and of the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification at work" (Brasil, 1988).

In a world facing growing socio-environmental challenges, Environmental Education in Brazilian High School emerges as an essential tool for building a sustainable future. By forming conscious and engaged citizens, this area of knowledge plays a crucial role in the transformation of society and the protection of the environment.

Environmental Education plays a crucial role in the education of high school students, being fundamental for the construction of a critical and responsible awareness in relation to the environment. In schools, it not only provides knowledge about ecology and sustainability, but also stimulates the development of practical skills and positive attitudes towards preserving the environment. In the face of global challenges such as climate change, biodiversity loss, and pollution, environmental education emerges as an essential tool to empower young people to become agents of change in their communities. In this sense, its teaching in high school not only broadens students' understanding of the interactions between humans and the environment, but also prepares them to face the environmental challenges of the 21st century in a conscious and sustainable way.

The *Fridays for Future* movement , started by young Swedish activist Greta Thunberg in 2018, quickly grew into a global mobilization for climate action. Thunberg began skipping school on Fridays to protest in front of the Swedish parliament, demanding stronger action against climate change. Their initiative has inspired millions of young people around the world to participate in school strikes and demonstrations, demanding that governments and global leaders take immediate and effective action to mitigate the effects of climate change. *Fridays for Future* highlights the urgency of the environmental crisis and the importance of engaging young people in the search for a sustainable future.

In this context, recognizing the great importance of Environmental Education for young people, this paper reviews the need and relevance of including environmental education classes in the school curriculum. In addition, it presents a case study on classes taught from the perspective of the *Fridays for Future* movement in a school in the interior of Amazonas, illustrating how this approach

can be implemented and its aspects of awareness and engagement of students in relation to environmental issues.

THEORETICAL BACKGROUND

There is a broad scientific consensus among scientists that climate change is real, caused by human activities, and poses a serious threat to the planet. The scientific consensus on climate change is based on a robust body of scientific evidence from diverse areas of knowledge, such as climatology, oceanography, glaciology, and paleontology.

The Intergovernmental Panel on Climate Change (IPCC), the main international scientific body for assessing climate change, warns in its reports of the urgency of ambitious actions to combat global warming. The IPCC states that greenhouse gas emissions need to be drastically reduced in the coming decades to avoid the worst impacts of climate change, such as extreme weather events, sea level rise, and biodiversity loss (IPCC, 2021).

The *Fridays For Future* (FFF) movement, also known as the Global Youth Climate Strike, emerges as a social and political phenomenon of great relevance in the current scenario, mobilizing millions of young people around the world in favor of urgent climate action. Through peaceful demonstrations and school strikes, FFF youth are pressuring governments and world leaders to take concrete action to combat global warming and build a sustainable future for the planet (FridaysForFuture.org).

This movement began in 2018, when young Greta Thunberg, just 15 years old, made the decision to skip school every Friday to protest in front of the Swedish parliament, seeking more ambitious political action to combat climate change. As a result, the movement quickly gained strength around the world and spread to several countries. Mobilizing millions of young people in peaceful demonstrations and school strikes. It was from this global expansion that FFF was consolidated as a youth-led global movement for climate action, demanding urgent action to address the climate crisis (FridaysForFuture.org).

In this way, the demands of the FFF reinforce the importance of incorporating Environmental Education in High School as a crucial tool for the formation of conscious citizens engaged in the construction of a sustainable future. Environmental education provides young people with the knowledge, skills, and values they need to understand the climate crisis, make informed decisions, and act proactively to address it (FridaysForFuture.org). In addition, the FFF movement highlights the need for quality education that prepares young people for the challenges of the 21st century, including climate change. Environmental education should be integrated into the high school curriculum in a transversal and contextualized way, using active and participatory methodologies that promote critical and reflective learning.

Understanding the importance of Environmental Education in the country's educational scenario, according to the National Common Curriculum Base (BNCC), Menezes and Miranda (2021) highlight what environmental education is in the country as:

> It is simply education resignified, bathed in concerns with the conservation of life, an education for the understanding of life in its range of complexity. This implies the revision of concepts and attitudes, it means overcoming apathy in the face of problems and being responsible for their possible solutions, in a solidarity movement in relation to the possibilities of the future (Brasil, 2017).

Menezes and Miranda (2021) also point out that, in their view:

> EE (Environmental Education), however, is materialized as a public policy in formal education resulting from the demand and mobilization of society. In view of all the historical references, actions and policies arising from the history of national education, EE consolidates the principles and objectives outlined by the PNEA and international documents, disseminating the experiences, methods, didactics and critical instruments already accumulated by EE, supporting the process of institutionalization and rooting of this theme in Brazilian education (Menezes and Miranda, 2021).

Despite highlighting the importance of Environmental Education, it has not yet been incorporated as a specific curricular component in the High School curriculum by the BNCC. However, this was defined as a cross-cutting theme that should be integrated into all areas of knowledge. This means that Environmental Education must be approached in an interdisciplinary and contextualized way in all subjects of High School, from the Human Sciences to the Exact Sciences (Colacios and Locastre, 2020; Brazil, 2022).

Colacios and Locastre (2020) also highlight in their work the concern for the absence of Environmental Education in the High School Curriculum:

> The theme of Environmental Education in the NLEM and the BNCC, documents that contain the curricular content, is basically null. It can be considered much more an absence than anything else. Because they are two instruments for organizing, regularizing and directing national education, it is understood that the absence of Environmental Education is significant. Its symbolism occurs in the clarity of the choices of the group that formulated the document for specific educational guidelines, in which the environment, the value of the natural world, and the emancipatory potential of Environmental Education are marginalized (Calacios and Locastre 2022, p. 5).

The insertion of Environmental Education in the school context is supported by a robust set of legislation and curricular guidelines, seeking to build a solid foundation for the implementation of this area of knowledge in a comprehensive and effective way. At the top of this structure, Law No. 9,795, of April 27, 1999, which instituted the National Policy for Environmental Education (PNEA), stands out. This law defines Environmental Education as a continuous and permanent process, with the objective of forming conscious and responsible citizens in the defense of the environment (Brasil, 2022).

In addition to the PNEA, CNE/CEB Opinion No. 11/2010 and CNE/CEB Resolution No. 7/2010 established the National Curriculum Guidelines for 9 (nine) year Elementary Education. These documents guide the integration of Environmental Education into the curriculum of this stage of basic education, ensuring that students develop the knowledge, skills, and values necessary to understand the importance of environmental preservation and act responsibly in building a more sustainable future (Brasil, 2017; Brazil, 2022).

Article 2 of the PNEA highlights that:

> Art. 2 Environmental education is an essential and permanent component of national education, and must be present, in an articulated way, at all levels and modalities of the educational process, in a formal and non-formal character (Brasil, 2022, p. 24).

The BNCC presents several guidelines for the implementation of Environmental Education in High School, such as:

- Addressing socio-environmental issues: The BNCC encourages the approach of socio-environmental issues relevant to the students' reality, such as the climate crisis, pollution, biodiversity loss and the challenges of sustainable development.
- Skills development: The BNCC proposes the development of socio-environmental skills in students, such as critical analysis of information, effective communication, problem solving and participation in decision-making processes.
- Promotion of values: The BNCC seeks to promote the development of socio-environmental values in students, such as environmental responsibility, respect for biodiversity and social justice (Leff, 2001; Sachs, 2004; Brazil, 2017; Brazil, 2022).

Although climate change is an emerging concern, it has a spotlight on the teaching of the environment and leads to several initiatives, the lessons sought for Environmental Education are not limited to this. Lustosa et al. (2023) highlight that:

> Routine situations, which guide our day-to-day lives, such as irregular waste disposal, contamination of rivers, fires, deforestation, are situations that students can be influenced to analyze and propose possible solutions according to the reality of the region, it is important to emphasize the importance of proposing solutions such as the application of didactic and pedagogical exercises (Lustosa et al. 2023, p. 4).

In summary, Environmental Education in High School is fundamental for the formation of conscious citizens engaged in the construction of a sustainable future. Through it, students can develop the knowledge, skills, and values necessary to understand today's socio-environmental challenges and act proactively to address them.

METHOD

Initially, a literature review on Environmental Education was carried out, highlighting its importance and the feasibility of its implementation in the school curriculum. For this, the Google Scholar database was used, with the search for the theme "The importance of Environmental Education in High School". Articles that address the subject from both theoretical and practical perspectives were selected, including case studies on the implementation of Environmental Education in schools in different regions of the country.

Another methodology involved the presentation of the *Fridays for Future initiative* to students in the 1st, 2nd and 3rd grades of Technical High School at the Maria Adelaide Marinho Hortência Full-Time Education Center, located in the municipality of Careiro Castanho, Amazonas, Brazil. First, the students were shown a video that explained the origin and main objectives of the initiative. The main objective of the practical class was to expand the students' knowledge about the environment, teaching them, mainly, to take care of the plants around the school and to understand the importance of environmental preservation.

In addition, the practical classes included teachings on plant biology, covering topics such as photosynthesis and the functioning of the ecosystem. Students also learned about the differences between wooded and non-wooded environments, highlighting the importance of green areas for the sustainability and health of the school ecosystem.

RESULTS

In view of the widely discussed need for interdisciplinarity in Environmental Education, 10 articles were selected to compose the discussion of this work. These articles deal mainly with the ways to insert Environmental Education in various areas of knowledge in High School. Table 1 presents the selected articles according to title, authors, and objectives.

Code	Authors	Title	Objectives
01	Braz, Duarte and Bottino 2022	Urban Rivers: 'Realizing the importance through Environmental Education	An educational action was implemented for elementary and high school students in Passos (MG), which consists of the presentation of concepts based on local problems and the application of questionnaires.
02	Cocato 2021	Critique of environmental education in the teaching of geography: discussion and pedagogical proposals	The objective is to discuss such activities that question environmental problems. An extensive bibliographic review is carried out and pedagogical activities are proposed according to the critical and applicable geographical teaching.
03	Dias e Silveira 2020	Environmental Education and the Construction of Dialogic Didactic Paths in High School	The objective of the work is to develop a space for dialogue and reflection on contemporary environmental problems, focusing on the search for alternatives and change in individual and collective behavior.
04	Ferreira and Diniz 2021	The importance of environmental education for Campo Grande (MS): P.A.I.S project in the agricultural school	The general objective was to identify the potential of the Integrated and Sustainable Agricultural Production Project (P.A.I.S.), and the mechanisms used for the development of

			sustainable agriculture in the agricultural school in Campo Grande-MS.
05	Brito et al. 2020	Environmental Education in the school environment	The purpose was to analyze how themes related to the environment can awaken, in students, the perception of environmental sustainability and the permanence of humanity on the planet, having as main guiding questions: citizenship, environmental perception, environmental practices and sustainability.
06	Lobato et al. 2020	The Importance of Environmental Education for the Teaching of Natural Sciences: A Look at Community Time	This study aimed to evaluate the importance of Environmental Education (EE) for the Teaching of NC at EDUCampo/UFCAT.
07	Pinheiro et al. 2021	The importance of environmental education for professional, teaching and human improvement	The research aims to: analyze how this subject is being worked on in school and the appreciation of the environment for living beings.
08	Silva e Silva 2020	An approach to the importance of interdisciplinarity in the teaching of Environmental Education in schools	The present work aims to present the importance of interdisciplinarity to the teaching of Environmental Education applied in school, seeking to raise some practices that can be applied during classes.
09	Silva et al. 2022	Environmental Education in the teaching of Chemistry: review of didactic-pedagogical practices about batteries in High School	The present work proposes to analyze classroom practices in the area of Chemistry, especially about batteries and drums, in order to point out ways for the inclusion of Environmental Education, aiming to promote reflections on the relationships of the human being with the environment.
10	Souza et al. 2022	Environmental education as a pedagogical tool in high school in the municipality of Itacoatiara-AM	The objective was to verify how this theme has been worked on in public schools in high school, to give focus and relevance to students, to consult the point of view of teachers, students and the interest of both in the subject.

The practical class taught to the students of the 1st, 2nd and 3rd grades of High School took place over two days, as they depended on the weather to plant the seedlings. Coconut seedlings (in the area at the front of the school) and mango seedlings (in the area behind the school) were planted around the school. Also, several ornamental plants were planted in the ornamental pots. The material for this practical class had the direct participation of the students, who donated the seedlings to be planted, since most of the students in these classes live and plant in rural communities and attend school. Therefore, most of them have already shown some experience in the practice of cultivation.

With the activity, students were able to learn more about the process of planting and growing plants, photosynthesis, and the entire ecosystem, including the difference between a wooded and non-wooded environment. The results of the practice were effective throughout the process, as the students dialogued among the classes involved, exchanged experiences of how their parents plant on their land and how this can improve life, food and also family income.

As one of the objectives of the practice was to change the students' view of environmental education and its importance as a source of training and awareness among young people, some reports about the success of the practice were made by the students. One of the students interviewed commented that: "We learned that the climate and the type of soil directly influence the development of the plant. The soil must be examined so that it is supplemented with the correct fertilizer. Despite the importance of manure, organic fertilizer is more easily acquired." Another student reported that:

"We learned how to make use of organic materials as fertilizer for plants, as they are less aggressive to the environment compared to manipulated fertilizers. In addition, it is easier for families who plant to use organic fertilizer. The practical class was very successful." Regarding the importance of the class for young people, another student reported that: "The class helped in the development of environmental awareness and the knowledge acquired can be passed on to the next generations, cultivate the integrating spirit of human and environment. Also, to be more aware of sustainable practices on a daily basis, such as saving water, energy, among others".

In summary, the teachers responsible for the class reported the strong participation of the students throughout the class, exchanging family experiences about the plants and the correct way to plant each one. The importance of the practical class for future generations was also discussed, who will be able to directly enjoy the planted trees when they grow and develop fruit. Therefore, the seed of awareness was planted that not only the present matters, but also future generations who are more likely to feel the result of today's environmental negligence.

DISCUSSION

According to the Ministry of Education, in the Environment Notebook (Brazil, 2022):

> Educating and learning are phenomena that involve all dimensions of the human being and, when this ceases to happen, it produces alienation and loss of social and individual meaning in living. It is necessary to overcome the forms of fragmentation of the pedagogical process in which the contents are not related, integrated and do not interact.

In short, this passage invites us to rethink education as an integral process that transcends the mere transmission of knowledge. An education integrates knowledge, promotes human development in its multiple dimensions and restores meaning to life, becoming the key to overcoming alienation and building a promising future for all. Of all the areas that can be highlighted in this sense, here we will highlight Environmental Education and the interdisciplinarity that promises to encompass it in all areas, especially in High School.

To this end, we can highlight the Fridays For Future movement, led by young people from all over the world, which is emerging as a social and political phenomenon of great relevance in the fight against climate change. Through peaceful demonstrations and school strikes, the FFF pressures governments and world leaders to take urgent action to combat global warming and build a sustainable future for the planet. Given the importance of FFF for younger generations, there is a broad connection between the movement and Environmental Education embedded in High School.

The FFF movement contributes to raising awareness among young people about the urgency of climate action, mobilizing them for collective action for environmental protection. The movement demonstrates the power of youth mobilization to promote positive social and environmental change.

With regard to the incorporation between the FFF movement and Environmental Education, we can highlight that the demands of the FFF reinforce the importance of Environmental Education in High School as a crucial tool for the formation of conscious citizens engaged in the construction of a sustainable future. And, Environmental Education provides young people with the knowledge, skills, and values they need to understand the climate crisis, make informed decisions, and act proactively to address it. In addition, the FFF movement highlights the need for quality education that prepares young people for the challenges of the 21st century, including climate change. In the search for the insertion of environmental knowledge into the country's education, environmental education was integrated into high school in a transversal and contextualized way, using active and participatory methodologies that promote critical and reflective learning.

According to the Brazilian Ministry of Education:

> The themes of the Environment are responsible for giving students, individuals and the community, through environmental education and its processes, social values, knowledge, skills, attitudes and competencies aimed at the conservation of the environment, a good for the common use of the people, essential to the quality of life and its sustainability (Brasil, 2022, p. 24).

Environmental Education can be an active response to the demands of the FFF movement, when the goal of the movement is added to the classroom. The following can be highlighted:

- Knowledge development: Environmental education in high school should provide students with the scientific knowledge necessary to understand the causes and impacts of climate change. This includes the study of climate systems, human action on climate, and the potential consequences of climate change for the planet and society.
- Skills for action: environmental education should develop in students skills for climate action, such as critical analysis of information, effective communication, problem-solving, and participation in decision-making processes. This will enable young people to become agents of social transformation, advocating for ambitious public policies and implementing actions in their communities.
- Values for sustainability: environmental education should promote the development of values for sustainability, such as environmental responsibility, respect for biodiversity, and social justice. This will allow young people to make informed decisions in their daily lives and contribute to building a more sustainable future for all.

In this way, presenting the FFF initiative to students is of paramount importance, as they perceive in a practical way the importance, mainly, of taking a stand on the changes they want to see. They also realize that actions involving the environment today can directly affect future generations. In the practical class taught to the 1st, 2nd and 3rd grade students of CETI Maria Adelaide Marinho Hortência High School, it can be seen that the students already had this awareness and were very

engaged in passing on these teachings to family members and the community. Thus, we believe that the main objective of making generations aware of the importance of Environmental Education has been completed.

There are several approaches to the application of Environmental Education in the classroom. One of them integrates the theme directly into disciplines such as Geography, Chemistry, Physics and Biology, which are directly related to the subject. Another approach consists of isolated practical classes, focused on current and local issues, aiming to make students aware of problems specific to the region where they live.

Interdisciplinarity in the teaching of Environmental Education at school is extremely important, as it promotes the integration of knowledge from various areas, providing a broader and more complete understanding of environmental issues. With an interdisciplinary approach, students can understand the complexity of environmental problems and their interrelationships with different disciplines, such as Science, Geography, Mathematics, among others (Silva and Silva 2020).

In addition, interdisciplinarity encourages critical reflection, teamwork, and the search for creative and innovative solutions to environmental challenges. By integrating different disciplines in the teaching of Environmental Education, students are encouraged to develop a holistic view of the environment, understanding the interdependence between human beings, nature, and society. Thus, interdisciplinarity in the teaching of Environmental Education at school contributes to the formation of citizens who are more conscious, responsible and engaged in the promotion of sustainability and environmental conservation (Silva and Silva 2020).

Braz, Duarte, and Bottino (2022), in a study carried out in Passos (MG), aimed to promote a school intervention with Environmental Education practices, aiming to sensitize young people at different school levels (1st and 2nd grades) about urban water resources. An educational action was implemented, through the presentation of concepts related to local problems. The author points out that the work resulted in a significant change in the students' perception of the importance of urban streams. Before the intervention, the students had a negative view of urban water resources, but after the educational activities, they began to better understand the importance of ecosystems, valuing them as much as the streams of preserved environments.

Addressing the theme of Environmental Education in the teaching of Geography, Cocato (2021) sought to criticize and discuss how the pedagogical activities of environmental education are presented in the current context of a globalized economy, especially in the teaching of Geography, and how these contents are addressed in the classroom. The work brings the presentation of pedagogical proposals that instigate students to participate in classes and shows the need for a critical and questioning view of current environmental problems. In addition, they emphasize the importance

of the active involvement of teachers and students and the search for more meaningful and transformative educational practices.

Dias and Silveira (2020) sought, in their work, to find pedagogical tools and methods that would prove useful for teaching and environmental awareness in the classroom. To this end, resources such as documentary screening, conversation circles, poster making, practical activities and the use of audiovisual resources were used. As a result, the authors described the high effectiveness of these resources in teaching Environmental Education, always aiming to sensitize students and promote discussions about existing environmental problems. As in our work, the teachers were able to perceive that these resources were effective in terms of student engagement, mobilizing discussions about not only the problems, but also seeking solutions for the environment. Thus, the use of audiovisual pedagogical resources can help teachers to incorporate Environmental Education in the classroom.

Another strategy that can be mentioned for the incorporation of Environmental Education in the classroom is the creation of projects that aim to develop this knowledge, as already mentioned, through theoretical classes, which instigate discussion among students, and also through practical classes. Ferreira and Diniz (2021), in their work carried out at the Agricultural School and Campo Grande (MS), present the Integrated and Sustainable Agroecological Production Project (P.A.I.S.). The project aims to insert Environmental Education in the school environment. Among the various results described by the authors, such as the use of agroecological practices, integration of theory and practice, healthy eating and community strengthening, environmental awareness stands out. The project contributed to the environmental awareness of students, families and the school community, promoting the dissemination of knowledge and the practical application of what was taught, strengthening the concept of Environmental Education. The same could be observed in our work, since the students brought the knowledge from home about planting and passed on the knowledge acquired in the practical class to the community.

Studies such as that of Lobato, Adams and Nunes (2020), Pinheiro et al. (2021) and Silva, Royer and Zanatta (2022) also highlight, as already described, the importance of integrating theoretical and practical classes on Environmental Education, highlighting not only the students' learning about important environmental topics, but also the teachers involved in these projects. Therefore, the approaches to Environmental Education themes are not only important for students, but also for teachers and the community, forming an integrative unit capable of taking care of the environment.

In a study carried out in Itacoatiara-AM-Brazil, Souza et al. (2022) sought to investigate and evaluate the environmental perception of students and teachers in two state schools, as well as to

analyze how the topic of Environmental Education is addressed in high school in these schools. As results found in the study, the authors highlight:

- The highlight is the average frequency with which environmental issues are addressed in the classroom, attributed to the lack of preparatory courses in environmental education for teachers, emphasizing the need for actions and projects in this area in schools;
- The greater interest of students in subjects related to the environment compared to teachers, evidencing the importance of effective environmental awareness, beyond just showing interest;
- The realization of projects in the area of environmental education with infrequency, mainly through transversal themes, indicating the inclusion of this theme in schools, but emphasizing the need for greater attention and implementation of projects in this area;
- The teachers' perception that environmental education should be considered as a curricular subject, aligning with the possibilities of the BNCC in high school, which can contribute to a quality education with an environmental focus.

These results highlight the importance of environmental awareness, the implementation of sustainable practices, and the effective inclusion of environmental education in the school curriculum to promote the preservation of the environment and greater environmental awareness among students and teachers in schools in Amazonas (Souza et al. 2022).

The results found by the aforementioned works and by our work indicated that the application of environmental practices in the educational process contributes to the formation of critical individuals committed to environmental issues, enabling a positive change in the perception and attitudes of students in relation to the environment. The inclusion of Environmental Education in educational institutions was highlighted as a key tool in the formation of a sustainable society, promoting an education based on environmental problematization and perception.

CONCLUSION

Environmental Education in high school is essential to form conscious and responsible citizens, capable of facing current and future environmental challenges. The importance of interdisciplinarity in this area is evident, as it allows for the integration of knowledge from diverse disciplines, providing students with a holistic and in-depth understanding of environmental issues. By approaching environmental topics through multiple perspectives, such as Science, Geography, Mathematics and others, interdisciplinarity enriches learning by encouraging critical thinking and the ability to solve problems creatively and innovatively. This approach not only broadens students' understanding of the complexity and interconnectedness of environmental problems, but also fosters

collaboration between different areas of knowledge, which is essential for the search for sustainable solutions.

Therefore, the effective inclusion of Environmental Education in the school curriculum, supported by an interdisciplinary approach, is crucial for the development of a sound environmental awareness and for the promotion of sustainable attitudes and practices among young people. This will contribute significantly to the preservation of the environment and the construction of a more sustainable and balanced future.

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Collaborative management in schools: Experiences on the role of Ibero-American Networks in Health Education

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ABSTRACT

Health education is complex and, in schools, involves not only specific teams, but also management, organizational climate, and curricula. In this context, we understand collaborative management as a model in which school leaders promote the involvement of the school community, are based on open communication processes, and are receptive to innovation. Networking, enhanced by digital technologies, is one of the resources of these collaborative practices in the management of schools that, at the same time, reinforce them. Following a methodological strategy of an exploratory and qualitative nature, we analyze in a comparative perspective the public policies that frame health education in schools. The focus is on two experiences carried out in a network, in Brazil and Portugal. The results allow us to (re)think health education strategies in the school context, based on collaborative management strategies and cooperation networks.

Keywords: Health promotion and education, Collaborative management and leadership, Competencies of health education professionals, Networking

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INTRODUCTION

School management is a crucial field of action for Education, as stated by Lück (2009, p.23):

> [...] school management is responsible for planning, organizing, leading, guiding, mediating, coordinating and evaluating the processes necessary for the promotion of educational actions aimed at the learning and training of students in order to make them capable of adequately facing the challenges of the globalized society and the knowledge-centered economy (Lück, 2009, p.23).

In this sense, it is evident that school management is intended to carry out the organization, mobilization and articulation of all the material and human conditions necessary to ensure the advancement of socio-educational processes, oriented towards the effective promotion of learning. In other words, the purpose of management is to create conditions for the learning of students in a given school institution to take place, and can go beyond ordinary pedagogical issues.

Thus, we can say that school management encompasses a set of norms, guidelines, actions, procedures and structure whose main objective is pedagogical, in which political and social learning is not discarded. This understanding converges with what Luck (2009, p. 24) states when he mentions the existing relationships in school management, which involves "people management, pedagogical management, school culture management and management of the school's daily life, aiming at the student's education, and all these factors are interrelated". The understanding of management from this perspective goes beyond merely administrative aspects and involves aspects related to autonomy, transparency, participation and, consequently, decision-making processes.

In fact, the idea of participation is related to the democratic process itself, as a means to make its realization viable. In other words, there is no democracy without participation, without mutual collaboration. In this way, we use collaborative management as equivalent to democratic management, since both arouse the motivation for the participation of the social actors that make up the school, seeking more horizontal relationships, with a view to equality in relationships and a decentralized and articulation model.

Thus, the democratization of Education indicates a need for the educational process to constitute a space for the development of the true exercise of democracy where actions need to be aimed beyond the expansion of school attendance. Democratization, the decision-making space that the school holds, only makes sense if it fulfills its function, which is to ensure social inclusion. All this explicit context that raises and highlights democratic management, collaboration and autonomy rectifies the need to propose educational public policies, which are concretized and made visible through the implementation of specific programs, actions and projects, such as those reported here.

Considering the elaboration and execution of intervention projects, in an intersectoral way, in education and health, it is worth noting that the network expeeriences had their approaches in

preventive policies that defend an objective and contextualized analysis and adequate to sociocultural diversities.

We will deal specifically with health education in schools, a theme that involves management, but also diverse professionals who make up a collaborative network (Harvey, Neff, Knight, Mukherjee, Tittle, Jain, Carrasco, Bernal-Serrano, Goronga and Holmes, 2022). In this context, we understand collaborative management as a model in which school leaders promote the involvement of the school community, based on open communication processes, receptive to innovation. Networking, enhanced by digital technologies, is one of the resources of these collaborative practices in school management.

Thus, this article is based on the understanding that collaborative management is based on and sustains the networks of Ibero-American experiences that we analyze here. Following a methodological strategy of an exploratory and qualitative nature, we analyze, from a comparative perspective, the public policies that frame health education in schools. In this way, we describe and analyze two experiments carried out in a network. One of these, developed by the Interdisciplinary Research Group on Representations, Education and Sustainability (GIPRES), of the State University of Bahia (UNEB) and is part of the Research Line on Social Representations and the Organization of School Space. In this sense, we privilege socio-educational practices and public educational policies to elaborate the intervention project in school health and safety, in a school of the Municipal Education Network of Salvador da Bahia, Brazil, through the preventive approach and the health education model that underpins the School Health Promotion Program. The other, aimed at schools in the ten municipalities that make up the Intermunicipal Community of the Region of Leiria, Portugal, involving the Open University in Portugal and the EDEX Foundation in Spain.

EXPERIENCE IN SALVADOR/BAHIA/BRAZIL

CHARACTERIZATION OF THE SCHOOL AND THE COMMUNITY

The Álvaro da Franca Rocha Municipal School (EMAFR), founded on 08/03/1960, is a Public Institution, part of the Cabula Regional Management. Created by Decree No. 9928/92, published in the Official Gazette of 12/29/1992, the school unit is a medium-sized school that has a physical structure that has 5 classrooms that work in the morning and afternoon shifts, has 1 secretariat, 1 kitchen, 1 covered patio, 2 bathrooms for students and 1 for teachers and 1 improvised coordination room. As for the teachers, there are 14 in total and most of them are pedagogues by training and there are also specialists in the areas of English language, physical education and fine arts. Pedagogical resources, materials and equipment are available for the teacher to carry out research and planning.

In 2022, the School offered classes from the 1st to the 5th year of schooling, with a total of 253 students in the two shifts of operation. The predominant age group of the students is from 6 to 14 years old and they are mostly from the neighborhood itself, but there are also children and young people from adjacent neighborhoods. These students are the children of people who work as street vendors, cleaners, street vendors, maids, bricklayers, vendors, among others. And, the school's IDEB in 2022 was 5.4, reaching the projected target for the period. Regarding the pass, fail and dropout rates for the year 2022, they were, respectively: 96%, 4% and we had no dropout.

Therefore, this school unit serves students in the early years of elementary school, especially from the community of Engomadeira (Figure 1), where most families are close to drugs, such as alcohol, tobacco, marijuana and even cocaine. Many parents, uncles, neighbors, older siblings of children and young people are involved in trafficking.

In the specific situation of alcohol use, it is possible to perceive in this school unit inserted in a neighborhood that, in some cases, alcoholic mothers neglect their children and put the team, to a certain extent, impelled to think of strategies that allow the development of preventive actions such as lectures, conversations with families in meetings, referrals to Psychologists and Social Workers.

Figure 1: School location map

Source: Santos (2019).

In view of the above, we conclude that this is a neighborhood of popular origin, disorderly urbanized, with a majority of economically disadvantaged residents who suffer from poverty, unemployment, violence, and drugs. These themes, according to Garrido (2021), among others, have mobilized the school as part of contemporary social issues. Therefore, we understand that in the process that involves management, climate and school organization and curricula, they are challenges

and perspectives for school health and safety. Thus, allied with the thought of Freire (1980), BOMFIM, CORREIA and AZEVEDO (2023) state that:

> [...] the management process does not only go through the path of administering, but also enables development thought of as a process of critical awareness of reality, which implies the act of establishing a transformative and liberating praxis (Bomfim, Correia and Azevedo, 2023, p.3).

These elements translate the existing social inequality, but it is the experiences and relationships established by its inhabitants, on a daily basis, that make the neighborhood a space beyond the physical conception, enabling the valorization of the place and the construction of bonds of belonging, between the community and the school.

EMAFR is well regarded by the Engomadeira community, especially for the pedagogical work it develops, with the direct participation of the community in the actions of the Institution. We emphasize that the relationship between school and community is in line with the meaning of the expression "school in partnership", which reveals a passage from the bureaucratic logic to a logic of partnership based on negotiation between social actors in order to suggest more horizontal relations (Alves and Varela, 2012).

We understand that the definition of values, mission and vision of the future integrates the perspective of collaborative and participatory management, reflecting the common goal of those who make up the school. EMAFR's values are inspired by article 3 of the Law of Guidelines and Bases of National Education (LDB 9394/96): excellence, as we seek to offer quality education to the community; creativity and innovation, as we encourage different ways to solve existing pedagogical and organizational challenges; pluralism of ideas and respect for human dignity; participation, through collaborative work; equality, with learning opportunities for all students, observing their specificities; transparency in the application and accountability of public resources, as well as in the actions carried out with the community, especially the community and other public bodies representing Education in the municipality of Salvador/BA. It is in this context that we achieve an insertion and good coexistence with the neighborhood community, thus facilitating the realization of pedagogical proposals, including intervention, described below.

THE INTERVENTION CARRIED OUT: HEALTH AND SAFETY AT SCHOOL

For the construction of this intervention proposal, we initially proceeded to the contextualization that evidences aspects of the educational reality from data collected in school documents such as Regiment, Pedagogical Political Project, among others. In addition to identifying the internal and external Social Network of the School, as well as the protection and risk factors identified in the school context.

Regarding the School's Social Network, we identified internal and external elements. In the first case, we effectively identified as partners: the school management, the educators, employees, the students themselves, the School Council and the Education Agent, an intern in the pedagogy area, responsible for carrying out actions in the school and assisting in the control of students' attendance, contacting them whenever a student is identified as absent. In the case of external elements, potential partners to present the school's proposal and mobilize them to participate, the following were identified: CRAS, NGOs and Social Projects, Medical Center and Guardianship Council - Institutions that carry out joint work, but that need to be intensified and strengthened with a view to preventive work.

Regarding the protective and risk factors identified in the school unit, we can highlight the following as protective strengths: 1) Existence of positive bonds between the school and the community; 2) Partnership and willingness of Faculty and Staff to carry out pedagogical activities with families and students; 3) Articulation of the pedagogical proposal with independent and local issues; 4) Clear definition of rules and boundaries within the school; 5) Confidence in the school's work; 6) Strong affective bonds and mutual respect between the community in general, family, students, teachers and staff; 7) Existence of cultural institutions in the neighborhood that work in partnership with the school and, 8) Inclusive attitude of the school. As weak or risk points, we had: 1) Location in an area of vulnerability; 2) Family members involved in drug trafficking; 3) Fragile partnership with some social facilities in the neighborhood; 4) Neighborhood and residents stigmatized as violent and, 5) Interference of extracurricular issues, especially of coexistence in the neighborhood, within the school.

Therefore, taking the School's annual Action Plan as contextualization, the intervention proposal aimed to develop strategies for the prevention of drug use with the training of multipliers, aiming to reduce the existing risk factors. To this end, it was supported in three axes (Integration of prevention in the school curriculum, youth participation and the training of multipliers, and strengthening of the school in and with the community), in order to develop actions with the development of social actors.

Taking this purpose as a guide, in a meeting with the pedagogical team - coordination and teachers. The meeting began with a collective discussion on the need to address the issue at school, from a preventive perspective. The group came to an understanding of a proposal for the theme of the Fair since the work on citizenship and human rights was already agreed, with the theme "Social Policies and Citizenship: what do we need to live well?". The idea was that the proposal would have the participation of the entire school community: family members, students, teachers, employees, coordination and management of the school, in addition to inserting the local community of the Engomadeira neighborhood.

At the end of the alignment meeting, we had suggestions for articulated themes to work on with the classes, namely: children's rights and duties; public health policies; social movements and democracy; women's and older people's rights; education; the neighborhood, the community, and social welfare; citizenship on social media (Bomfim, Correia and Azevedo, 2023). This moment corresponded to *Stage 1 - Integration of prevention into the school curriculum.* With these definitions collectively made, we move on to the next stage of the intervention.

Stage 2 - Implementing preventive actions – from theory to practice, we seek to encourage youth protagonism through the creation of discussion groups in the classroom. In this way, we started the actions related to youth participation and the training of multipliers. The teachers used different methodologies and the use of texts, videos, interviews with local residents, among others, which were constantly shared in the group, in the planning meetings. The neighborhood and the local community were portrayed beyond the stigma of the periphery, expanding the students' understanding of the neighborhood, by highlighting its positive aspects, such as the existing collectives, the institutions and people with representation in the community. The idea was to avoid the stigma of the neighborhood, as violent, peripheral, where drug trafficking is highlighted. We went the other way, talking about the history of the neighborhood, about its positive points, we brought older people to tell how the neighborhood was like, making a comparison of how it is now and why, in a critical way, etc. We also address the issue of citizenship on social networks, the risks, how to proceed in a conversation with strangers, *fake news*, social media rules, among others.

It was an intense period of work that culminated with an event open to the community, exhibition of the works, artistic presentations, among others. These actions were related to *Stage 3 - strengthening the school in the community and with the community*, expressing the specific objective of the intervention proposal, which was to hold a Cultural Fair as a culmination of the intervention project based on the productions made with the classes.

As stated by Bomfim, Correia, and Azevedo (2023), the intervention project presents achievements, challenges, solutions, and perspectives at five levels – personal, professional, group, institutional, and community, considering the perspective of collaborative management as a factor in promoting health and safety at school, as evidenced in Chart 1, below:

Table 1: Achievements, challenges and perspectives of the intervention

Levels	Conquestas	Challenges	Perspectives
Staff	Learning, knowledge and overcoming misconceptions.	Overcoming prejudices in relation to unknown issues.	Dissemination of the proposal/experience in other environments.
Professional	Learning, knowledge and overcoming misconceptions.	Lack of more in-depth knowledge of the subject.	Disseminate the knowledge and experience acquired.
Group	Study of the theme.	Collective adhesion to the proposal and insertion of actions in the School's work proposal.	Use of researched material such as texts and videos.
Institutional	Collective expansion of the intervention proposal.	Insertion of the proposal in the School's PPP.	Insertion of more consistent actions for work in later years.
Communal	First approach made on the subject in the history of the school.	Approaching the topic in an unconducive environment.	Address issues preventively and involve the local community.

Source: adapted from Bomfim, Correia and Azevedo (2023, p. 13).

In this way, we become multipliers of the proposal within the school. We feel that what has been done can be improved, expanded, with the participation of the entire school community, in a more effective way in the year 2020. Therefore, we sought to include the proposal in the school's annual plan.

EXPERIENCE IN PORTUGAL

CHARACTERIZATION

Health education is complex and, in schools, involves not only specific teams, but also management, organizational climate, and curricula (Harvey, Neff, Knight, Mukherjee, Tittle, Jain, Carrasco, Bernal-Serrano, Goronga, and Holmes, 2022). In this context, collaborative management adopts a model in which school leaders promote the involvement of the school community, are based on open communication processes, and are receptive to innovation (Zukowsky-Tavares, Marinho, Aguiar, and Rossit, 2022). Networking, enhanced by digital technologies, is one of the resources of these collaborative practices in the management of schools that, at the same time, reinforce them.

In the experience described here, the Intermunicipal Community of the Region of Leiria[i] (CIMRL) within the scope of its competences provided a training action for applicators of the "The Adventure of Life" program. This training action resulted from a collaboration network established between the Intermunicipal Community of the Region of Leiria, Fundación Edex (from Bilbao, Spain, which designed and developed the program and the Open University (UAb), the only Portuguese public university of digital education. "The Adventure of Life" is a health education program in a school context, based on the development of personal and social skills and the promotion of healthy lifestyle habits (EDEX, 2010). The program consists of 2 fundamental axes[ii]:

- Thematic axis, focused on the health habits that the program proposes to address – activity and rest, alcohol, tobacco, medicines, hygiene and safety.
- Cross-sectional axis, related to the life skills that the program seeks to develop - self-respect, facing challenges, managing tension, relating and making decisions.

It is aimed at children between 8 and 11 years old and provides for the involvement of teachers, families and the community in the proposed activities with the students. It consists of a set of animated video stories, booklet and respective stickers, materials that have been translated into Portuguese and adapted to the context of application and intervention by a team of specialists.

Given the geographical dispersion of teachers and technicians in the municipalities, offering the training action in a network digital education regime seemed to be the most appropriate. The action was then designed based on the Virtual Pedagogical Model of the Open® University based on four fundamental pillars: student centrality, in which students play an active role in the construction of their knowledge process; flexibility, based on a predominantly asynchronous communication model; diversified interaction not only with teachers, but also with resources and among the students themselves, constituting learning communities; digital inclusion, to the extent that immersion in the digital environment in learning activities promotes the development of digital skills and, thus, digital inclusion (Mendes, Bastos, Amante, Aires, Cardoso and Loureiro, 2018).

INTERVENTION

The training action for applicators of the A Aventura da Vida program had 3 editions, one attended consistently by 12 municipal technicians, the second and third attended consistently by 12 and 7 teachers of the 1st cycle of basic education (CEB) respectively[iii]. A period of online acclimatization preceded the formal start of the activities, with the aim of promoting in the participants the familiarity with the virtual learning environment, the integration of some netiquette norms and also the interaction between the participants, favoring the construction of a sense of community. This strategy is common at UAb, where the attendance of the online onboarding module precedes the start of any course, formal or non-formal, in a mandatory and free way and has been demonstrating widespread effectiveness. In particular, in reducing adaptation difficulties and drop-out rates.

The training action for Aventura da Vida applicators was organized around three major themes that took place over seven weeks.

- The first theme, *Transversal Skills*, aimed to promote knowledge about Life Skills. In this sense, support resources were made available and a discussion was promoted based on Life Skills, around the following questions: what are they? How do they come about? What are they for? How can they be taught and learned in the classroom? This activity

allowed the participants to mobilize knowledge, but also to share experiences from their professional and, occasionally, personal experience.

- The second theme focused on *Healthy Lifestyle Habits*, having provided the first contact with the program, its nature, application methodology and the ways in which it can be explored in a concrete intervention. In this sense, the design of an activity involving the family and mobilizing resources from the community was proposed. As much as possible, this activity should be articulated with the curricular and disciplinary development of the class.
- The third, *The Adventure of Life*, focused on one of the 12 themes (self-respect, facing challenges, managing tension, relating, making decisions, medication use, alcohol consumption, tobacco consumption, activity and rest, food, safety and hygiene), as well as the necessary interaction with other elements of socialization, such as family and community, for example. In this sense, the participants were challenged to explore the potentialities between the program and reality (school, family, community) in the planning of an activity to be effectively applied. This planning was guided by the following aspects: theme, objectives and relationship with the school curriculum, methodology and strategies, resources and materials, schedule, evaluation.

The following table summarizes the result of the strategies planned and developed by the applicators integrated in the training actions.

Table 2: Themes, strategies and evaluation

Themes	**Strategies**	**Evaluation**
Oral hygiene; Healthy eating; Protection of the environment; Physical activity and rest; Interpersonal relationships and conflict management; Safety rules; Respect for oneself and self-concept; Family diversity; Decision-making processes.	Articulation with the curricular contents (e.g. study of the environment, written expression, oral communication, calculation and graphic representation, expressions); Family Collaboration Integration into the community; Participation of other agents (e.g. health, NGOs, security forces, companies).	Observation logs; Peer review; Bar charts; Questionnaire surveys; Jobs done/products.

Source: The Authors (2023).

The results of the activities thus developed were diverse. They went through research work, plastic and written expression, and oral presentation. But also interaction with community structures. By way of illustration, we can refer to the promotion of a healthy diet through the introduction of

fruits in the children's snacks, which required the involvement of families. The realization of works of plastic and artistic expression of representation of emotions that was later exhibited in an exhibition open to the community. The call for external entities for the development of road education activities. Outlets for cleaning common areas through garbage collection and separation. Parallel to these activities, which mobilized more agents, others took place with more restricted purposes, more focused on the class group. As an illustration, we can mention the case of a class with high levels of interpersonal conflict and with which more focused activities were developed. For example, the challenge of identifying and presenting the qualities of colleagues. This activity was developed in the class space and was the motto for others that, together, allowed to improve the quality of interaction, communication, identification and expression of emotions, with reflections on the reduction of conflicts.

Both the planning and the application were shared and monitored during the training action, which resulted in very enriching moments for all involved. In particular, by presenting the activities and strategies developed and their results, other teachers benefited from this sharing as possibilities to be implemented in their own contexts and classes. This collaborative dynamic between peers is, therefore, relevant at several levels: in the professional development of teachers, in the reinforcement of the teacher's leadership role, in the innovation of teaching practice and in the quality of student learning (Alves, Macedo, Madaleno, Martins and Martins, 2022).

This idea of teacher leadership refers to a profile of adaptation, communication, critical reflection and questioning. Such a profile requires a posture of constant learning, throughout life and throughout the life cycle (Massano and Henriques, 2018). Hence, the importance of the training action under analysis here is reinforced.

The space of the action became available after the formal end of the action, allowing the continuity of sharing, in a logic of a virtual community of practice (Wenger, Mcdermott and Snyder, 2002). As organic entities, communities of practice need to evolve dynamically. Part of this evolution is the reinforcement of the integration of the A Aventura da Vida program in the formal curriculum and throughout the school year. This results in the development of life skills and a real promotion of health in schools.

The dynamics described here have been enhanced by digital technologies. The fact that the training action is offered in digital and networked education, allowed it to be attended without physical, geographical or schedule constraints. The applicators benefited from a flexibility that made it easier for them to reconcile professional demands and the dynamics of family and personal life with study. At the same time, it requires an effort, organization and management of time and autonomy of work. In this sense, the community has also organized itself in a digital environment. We speak, therefore, of a virtual community of practice to the extent that all interaction and sharing

takes place in a virtual environment, thus allowing these teachers to keep in touch, share doubts and difficulties, experiences and challenges. Collaborative work does not end with the end of the training action, because The Adventure of Life is not a recipe for a single application, it is a basis to be experimented and developed in each context, in each class, in each school year.

FINAL THOUGHTS

Both shared experiences reaffirm the need for (cor)relations of forces exerted on objects arising from reality that link the relevance of what is lived, conceived and perceived (Garrido, 2019) and articulated in an intersectoral way with Education and Health. This implies research developed, in a solidary and collaborative way, in search of challenges, solutions and perspectives that require collaborative management as a factor in promoting health and safety at school. These experiences developed through intervention and shared projects also reinforce the idea that management and collaborative leadership in the school context are effective at various levels, as had already been evidenced in previous studies (e.g., Zukowsky-Tavares, Marinho, Aguiar, and Rossit; 2023).

First, in promoting the professional development of teachers who feel motivated and supported in the frequency of training actions. At the same time, in stimulating and supporting pedagogical innovation, practices and strategies in the classroom and others that go beyond the walls of the school. Namely, those that call for the involvement of the family and the approximation, or even intervention, of the community. These practices also have an impact on the quality of learning (Alves, Macedo, Madaleno, Martins and Martins, 2022).

The collaborative networking that underpinned each of the experiences described and discussed in this article allows us to (re)think health education strategies in the school context, within the framework of collaborative management or leadership. Collaborative leadership makes it possible to frame, in this way, the responses to the challenges that arise in the face of a new culture of continuous learning, in context, and focused on professional development and the improvement of educational quality.

The performance of management and collaborative leadership addressed in this study implies the various levels of school organization. On the one hand, there is the exercise of top-level and/or intermediate coordination that supports (or at least does not block) initiatives that go beyond those envisaged within the school organisation itself. On the other hand, the exercise of the margins of autonomy and initiative on the part of teachers to promote the improvement and innovation of their practices. At any of these levels of leadership, the importance of a culture of collaboration is evidenced in the promotion of joint questioning and reflection, the sharing of relevant scientific-pedagogical and management practices, the shared development of diversified materials, strategies

and methodologies, creative problem solving, support in decision-making processes, etc. (Alves, Macedo, Madanelo, Martins and Martins, 2022).

We also highlight, at this stage, that the analysis presented allows us to highlight the importance of the relationships established and, at times, strengthened with the surrounding community. This notion of community includes the students' families, but goes beyond that, also integrating other agents and structures such as local personalities, non-governmental or cultural organizations or public entities (such as the security forces or local authorities). The diversity of groups, resources and actors mobilized by the school reveal changes in the administration and management models of schools, as well as the need to ensure and promote more innovative, integrated and meaningful activities for students.

In summary, the experiences presented in this article configure, in global terms, logics of opening the school to the community, multilevel collaboration within the school organization, dynamization of extended networks that enhance development and innovation. Therefore, it is pertinent, in our view, to promote a deeper understanding of these dynamics. Based on the results presented, the following axes are identified to be developed in future research: i) collaborative leadership and management in a network; ii) collaboration, involvement and participation of the school community; iii) integration of health education into the school curriculum; iv) strengthening health education from a community perspective.

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[1] An association of municipalities (the Portuguese administrative division equivalent to the prefecture in Brazil)

composed of 10 municipalities - Alvaiázere, Ansião, Batalha, Castanheira de Pera, Figueiró dos Vinhos, Leiria, Marinha Grande, Pedrógão Grande, Pombal and Porto de Mós. This is a measure that aims to address the trend of decentralization of competences, especially in the areas of education and health.

[2] https://www.edex.es/portfolio/la-aventura-de-la-vida/.

[3] In the education system, Portuguese corresponds to the first 4 years of schooling, approaching elementary school in the Brazilian education system.

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