AUGMENTED COGNITION IN PUBLIC EDUCATION: AN EXPERIENCE REPORT FROM THE LIRE PROJECT ROBOTICS CLUBS IN BRUSQUE, SANTA CATARINA, BRAZIL

COGNIÇÃO AUMENTADA NA EDUCAÇÃO PÚBLICA: UM RELATO DE EXPERIÊNCIA EM CLUBES DE ROBÓTICA DO PROJETO LIRE – BRUSQUE/SC

COGNICIÓN AUMENTADA EN LA EDUCACIÓN PÚBLICA: UN RELATO DE EXPERIENCIA EN LOS CLUBES DE ROBÓTICA DEL PROYECTO LIRE – BRUSQUE/SC

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ABSTRACT: The growing presence of digital technologies in education expands the construction of knowledge, especially when combined with practices that place the student at the center of learning. In this context, educational robotics proves to be a promising strategy, in which programming, electronics, problem solving, and collaboration converge into meaningful experiences. This article reports and reflects on the experience developed in the Robotics Clubs of the LIRE Project (Itinerant Educational Robotics Laboratory), an initiative of the Municipal Department of Education of Brusque (SC), followed by the author as a teacher educator. The reflection is organized around augmented cognition, understood as the expansion of cognitive possibilities arising from the interaction among students, digital technologies, and pedagogical mediation. Recurring situations observed in the workshops are discussed, along with their connection to Piaget, Papert, Resnick, and Freire. The experience suggests that educational robotics, integrated into interdisciplinary projects and inquiry-based practices, fosters autonomy, creativity, collaboration, and computational thinking, constituting a possibility for public education.

KEYWORDS: Augmented cognition. Public education. Educational robotics.Educational robotics. LIRE Project.

***RESUMO**: A presença crescente das tecnologias digitais na educação amplia a construção do conhecimento, sobretudo quando articulada a práticas que colocam o estudante no centro da aprendizagem. Nesse contexto, a robótica educacional mostra-se uma estratégia promissora, em que programação, eletrônica, resolução de problemas e colaboração convergem em experiências significativas. Este artigo relata e reflete sobre a experiência desenvolvida nos Clubes de Robótica do Projeto LIRE (Laboratório Itinerante de Robótica Educacional), iniciativa da Secretaria Municipal de Educação de Brusque (SC) acompanhada pelo autor como professor formador. A reflexão organiza-se a partir da cognição aumentada, compreendida como a ampliação das possibilidades cognitivas decorrentes da interação entre estudantes, tecnologias digitais e mediação pedagógica. Discutem-se situações recorrentes nas oficinas e sua aproximação com Piaget, Papert, Resnick e Freire. A experiência sugere que a robótica educacional, integrada a projetos interdisciplinares e práticas investigativas, favorece autonomia, criatividade, colaboração e pensamento computacional, constituindo possibilidade para a educação pública.*

***PALAVRAS-CHAVE**: Cognição aumentada. Educação Pública. Robótica Educacional. Projeto LIRE.*

***RESUMEN**: La creciente presencia de las tecnologías digitales en la educación amplía la construcción del conocimiento, sobre todo cuando se articula con prácticas que colocan al estudiante en el centro del aprendizaje. En este contexto, la robótica educativa se muestra como una estrategia prometedora, en la que la programación, la electrónica, la resolución de problemas y la colaboración convergen en experiencias significativas. Este artículo relata y reflexiona sobre la experiencia desarrollada en los Clubes de Robótica del Proyecto LIRE (Laboratorio Itinerante de Robótica Educativa), iniciativa de la Secretaría Municipal de Educación de Brusque (SC), acompañada por el autor en su condición de profesor formador. La reflexión se organiza a partir de la cognición aumentada, comprendida como la ampliación de las posibilidades cognitivas derivadas de la interacción entre estudiantes, tecnologías digitales y mediación pedagógica. Se discuten situaciones recurrentes observadas en los talleres y su aproximación con Piaget, Papert, Resnick y Freire. La experiencia sugiere que la robótica educativa, integrada a proyectos interdisciplinarios y prácticas investigativas, favorece la autonomía, la creatividad, la colaboración y el pensamiento computacional, constituyendo una posibilidad para la educación pública.*

***PALABRAS CLAVE**: Cognición aumentada. Educación pública. Robótica educativa. Proyecto Robótica educativa. Proyecto LIRE.*

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Introduction

In recent decades, the advancement of digital technologies has profoundly modified the ways of producing knowledge, communicating, and solving problems. This scenario reached education, driving new teaching methodologies capable of integrating technological resources with the development of cognitive, creative, and socio-emotional skills. Educational robotics promotes learning through the construction of prototypes, programming, and collaborative problem-solving of real challenges.

In Brazil, the consolidation of digital culture in education received an important boost with the enactment of Law No. 14.533/2023 (Brazil, 2023), which established the National Digital Education Policy. The legislation recognizes the need to promote digital literacy, computational thinking, innovation, and technological inclusion as essential components of student training. In parallel, the National Common Curricular Base (Brazil, 2017; 2022) establishes competencies related to the critical and creative use of digital technologies, reinforcing the importance of pedagogical practices that go beyond the mere use of equipment and promote the effective construction of knowledge.

Nesse contexto, a robótica educacional é uma abordagem capaz de integrar conceitos matemáticos, computacionais e artísticos para concretizar a aprendizagem. In this way, the student mobilizes knowledge from different areas simultaneously, exercising skills such as abstraction, problem decomposition, hypothesis formulation, experimentation, error debugging, and systemic thinking. Technology ceases to be an end and becomes a mediator of learning. Educational robotics favors processes that can be understood as forms of augmented cognition. In this understanding, technological devices and environments expand human capacity to reason and model complex situations to build solutions. The interaction between student and digital tool creates conditions for deeper, collaborative, and meaningful learning.

Within this perspective, the LIRE Project (Itinerant Laboratory of Educational Robotics), developed by the Municipal Secretariat of Education of Brusque, in Santa Catarina, contemplates the democratization of access to educational robotics through robotics clubs distributed in municipal schools, offering continuous training to teachers and practical activities to elementary school students. The proposal combines electronics, programming, automation, maker culture, and active methodologies in a pedagogical organization that encourages student protagonism and project-based learning (Silva *et al*., 2025). Since its implementation, the LIRE Project has gradually expanded its scope and consolidated a training model that articulates

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teacher trainers, multiplier teachers, and monitors, allowing schools to develop permanent educational robotics activities (Silva; Vicentini; Mayer, 2025). As examples of construction, which highlight the diversity of experiences in the clubs, include line-following robots, Bluetooth-controlled robots, robotic arms, automated systems, digital games, and interactive animations.

Despite the practical benefits of educational robotics, research investigating its contribution to augmented cognition processes in public education is still scarce. This gap motivates the present study, which seeks to understand how the pedagogical practices developed in the LIRE Project favor the expansion of cognitive, creative, and socio-emotional capacities. Thus, the objective of this article is to report on the pedagogical experience developed in the Robotics Clubs of the LIRE Project, with students from the 6th to 9th grade of Elementary School, discussing how the practices favor the processes of augmented cognition.

Methodology

This work is characterized as an experience report, of a qualitative, descriptive, and reflective nature, developed from the author's own performance as a training professor for the LIRE Project (Itinerant Laboratory of Educational Robotics). In the experience report, the author systematically and critically narrates a significant professional experience, aligned with theoretical references that allow for its understanding and discussion (Daltro; Faria, 2019; Mussi *et al*., 2021). Unlike an empirical investigation that collects and analyzes data about participants, the account's object is the lived practice itself and the reflection that arises from it. Therefore, this manuscript constitutes an experience report based on critical reflection on a professional practice experienced by the author himself.

The qualitative approach is justified by its preference for understanding the meanings and processes involved in educational phenomena, rather than measuring variables or establishing statistical cause-and-effect relationships (Minayo, 2014). In this sense, the intention is not to produce generalizable evidence about students' cognitive development, but to describe in an organized manner the pedagogical work carried out in the Robotics Clubs and interpret it in light of contemporary theories on learning, constructivism, and augmented cognition. That said, it is necessary to clarify that the author simultaneously occupies the role of educator and narrator of the experience, in a reflective practitioner stance, that is, one who reflects on their own actions to extract understanding and improvement from them (Schön,

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2000), so that the considerations presented express their perception and interpretation, with the inherent limitations of this point of view, and are presented as observations from the trainer, not as verifiable empirical findings.

The experience reported was developed within the scope of Project LIRE, an initiative of the Municipal Secretariat of Education of Brusque, Santa Catarina, aimed at democratizing access to educational robotics in municipal public schools. The project organizes Robotics Clubs, which take place in the morning and afternoon shifts, distributed throughout the network, offering equipment, teaching materials, and continuous training to the professionals involved, in order to enable systematic contact with the technological collection of Educational Robotics and the maker culture, regardless of the technological infrastructure of each school unit. This structure distributes complete kits with basic components to expand students' access to educational robotics.

The project is currently in its fourth edition, serving seventeen municipal schools. This report focuses on the experience developed by the author in four of these schools, involving approximately one hundred and sixty students from the final years of Elementary School, where he acts as a training teacher. Each club brings together, on average, twenty students, and all belong to Middle School, from the 6th to the 9th grade, distributed in morning and afternoon shifts, with ages between eleven and fourteen years old. Thanks to the schedule, we gradually expanded our knowledge, starting with basic concepts of electricity and electronics and moving on to programming logic.

In addition to equipping schools, the project includes a model that integrates teachers and students with technological resources around proposals based on project-based learning, the maker culture, and problem-solving. The pedagogical model of the LIRE Project is composed of different professionals working collaboratively. The Training Professor plans the didactics of the workshops, conducts training sessions and activities; the Multiplier Professor, assigned to the school, accompanies and develops the students' proposals, and the Monitor III operationalizes the teams' demands. This organization allows students to develop extensive and complex annual projects.

The LIRE Project Robotics Club meetings, two hours weekly, cover theoretical training, prototyping, and project development. Supported by programming environments (mBlock and Arduino IDE), students build structured objects for the Arduino Mega 2560 platform and its extensions. We introduced the concept of block programming for developing games and

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animations, as well as the use of sensors, and at the end, we migrated to textual programming in the Arduino environment.

The experience is based around the construction of concrete projects, electrical circuits that are the foundation for a range of other complex projects in diverse areas of human need and entertainment. I cite as an example the construction of a robotic arm, which is still in the development phase, but involves planning, prototyping, mechanical and electronic assembly, programming, testing, failure identification, and successive improvements. The kits distributed have different resources available according to demand: Arduino Mega boards, protoboards, sensors (infrared, ultrasonic, humidity, PH, gas, etc.), DC motors, servomotors, Bluetooth modules, H-bridges, electronic component kits, and computers, in addition to the mBlock, Arduino IDE, and Tinkercad environments. In this way, the student transitions between the virtual and the physical.

We cite active methodologies, Project-Based Learning, the STEAM approach, the Maker Culture, Engineering Design, challenge-based learning and collaborative solutions, and guided experimentation as tools for activities, in line with other formative experiences of the LIRE Project itself (Vicentini; Silva; Mayer, 2025). In this scenario, the teacher is the mediator who encourages hypothesis formulation, solution testing, error analysis, and knowledge construction. The articulator that shows error as an educational method, an opportunity for reflection and process correction.

The reflections gathered here result from the author's continuous monitoring of activities throughout his work as a teacher trainer, in an observation of a participatory nature, characteristic of someone who experiences and, at the same time, records the experience (Lüdke; André, 2013). No research instruments were used for data collection, nor was there any data analysis in the technical sense of the term. What is presented is the systematization of teaching experience, a procedure that gives the report its scientific character when conducted in an organized, well-founded, and critical manner (Mussi *et al*., 2021). For organizational purposes, the report is structured around axes of reflection that correspond to recurring aspects perceived by the trainer during the workshops: (i) the development of computational thinking, (ii) intellectual autonomy, (iii) interdisciplinarity, (iv) creativity, and (v) socioemotional skills. These do not constitute categories derived from an empirical data analysis process, but rather interpretive keys that articulate the lived experience reported with the theoretical references discussed in the foundation, ensuring coherence between the nature of the work and the scope of its claims.

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By its nature, the account of an experience has a limited scope and limited explanatory power (Daltro; Faria, 2019). The perceptions described here refer to a specific context in four municipal schools in Brusque, SC, and to the interpretation of an observer directly involved in the activities, which may introduce biases inherent to the position of the person reporting their own practice. In qualitative research, however, the researcher's involvement does not invalidate the knowledge produced, as long as it is assumed and explicitly stated in a reflective manner (Minayo, 2014). It is not intended, therefore, to generalize the observations to other contexts nor to conclusively attribute, and exclusively to robotics activities, the perceived advances; recognizing these limits honestly delimits what the experience allows us to affirm and points the way for future empirical investigations, conducted with corresponding methodological procedures.

Augmented cognition as an interpretive lens for experience

The experience developed in the Robotics Clubs of the LIRE Project indicates that the significant learning observed among students cannot be explained solely by the acquisition of technical knowledge and the development of activities. Notably, the transformation in how students approach problem-solving situations, organize their thoughts, share strategies, and build collective solutions is striking. This perception motivates the search for a theoretical perspective capable of interpreting the processes more broadly. In this work, this perspective is represented by the concept **of** augmented cognition, understood as an interpretive category that allows us to comprehend the expansion of cognitive capacities when human thought develops through interaction with cultural instruments, digital technologies, learning, and social relationships. In this perspective, technology does not replace thoughts or people; in reality, it expands representations, tests hypotheses, reorganizes strategies, and builds knowledge in a progressively more argumentative and complex way.

Inserting augmented cognition as an axis of interpretation implies understanding that intellectual development does not stem exclusively from the use of technological resources. Digital tools only acquire educational meaning when integrated into pedagogical practices that challenge students to reflect on what they do. It is the quality of the interactions established between subjects, technologies, and teacher mediation that produces learning. This understanding approaches Jean Piaget's (1975) contributions by conceiving knowledge as the result of an active construction by the subject when faced with challenges presented by the

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environment. For the author, learning means reorganizing cognitive structures whenever the explanations constructed fail to respond to the situations encountered. Thus, error is not failure, it is an essential part of intellectual development; more than correcting errors, they are led to reconstruct ways of thinking about the problem itself.

While Piaget (1975) helps us understand how knowledge is constructed, Seymour Papert (1980) focuses on learning mediated by the creation of meaningful artifacts. In constructivism, learning is producing something that makes sense to the learner. Building prototypes generates opportunities to transform ideas into objects, leading to planning, experimentation, revision, and refinement. In the LIRE Project workshops, building is constructing thoughts. The students reproduce beyond what is established, propose changes, solutions, and test distinct ways of solving challenges.

Mitchel Resnick's (2017) reflections emphasize that learning becomes deeper when it occurs around projects that mobilize personal interests, creativity, collaboration, and experimentation. By systematizing the principles of creative learning: projects, passion, peers, and play, Resnick (2017) demonstrates that educational environments capable of stimulating authorship and investigation favor more lasting forms of knowledge construction. From this perspective, creating an automated solution or developing a digital game allows the student to make sense of what they are learning. Defending an education based on dialogue, problematization, and the protagonism of individuals, Freire (1996) understands knowledge as the result of a practice in which educators and students learn together by investigating reality. This understanding is vital for interpreting experiences in which the teacher acts as a mediator of investigative processes, as many challenges have varied solutions and require listening, negotiation, reflection, and collective construction.

In this work, such references contribute to understanding the educational experience. Piaget (1975) allows for the interpretation of cognitive reorganization processes; Papert (1980) highlights learning constructed through the creation of artifacts; Resnick (2017) expands this discussion by emphasizing creativity, authorship, and collaboration; and Freire (1996) offers elements for understanding pedagogical mediation and student protagonism. Gathered under the perspective of augmented cognition, these references help reflect on the experiences lived in the Robotics Clubs of the LIRE Project. It is between personal experience and theoretical foundation that the following reflections are developed. Instead of proving effects, the report seeks to understand how the situations experienced in the workshops broaden the understanding of learning processes mediated by digital technologies in public education.

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The path of experience

My participation occurs in the capacity of a training professor, responsible for the pedagogical planning of the workshops, for the training of multiplier teachers, and for the monitoring of the activities developed. Thus, I follow the daily lives of the Clubs and observe the execution of activities and the strategies developed, the difficulties, discoveries, and personal relationships during project development.

The reflections presented in this report do not stem from the application of formal research instruments nor from the production of data intended for hypothesis testing. They are built within professional experience, throughout the practice of teaching, in daily observation, and from the need to pedagogically understand what is recurrent in working with students. The object of this article is not the students as participants in an investigation, but the teaching experience itself developed within the context of Project LIRE and the learnings that emerged from it.

The planning of this content sequence is flexible according to the students' interests and demands, allowing for dealing with difficulties or including unexpected solutions. The activities aim at the construction of concrete projects. Recursive electrical circuits, automated systems with various sensors, digital games, interactive animations, line-following or Bluetooth-controlled robots, joints, and mechanical prototypes are opportunities to apply concepts of programming, mathematics, physics, and engineering. Together, these knowledges form a mix of challenges and tools that gain meaning when, beyond reproducing procedures, they are challenged to propose adaptations, test alternatives, and improve their own solutions.

The richest learning moments arise when a circuit stops working, an algorithm produces unexpected behavior, or conflicts of ideas emerge. In these moments, the workshop transcends teaching and transforms into an environment for investigative dialogue, building collective knowledge to explain and remedy individual errors. Next, without establishing cause-and-effect relationships or generalizing conclusions to other educational contexts, the article delves into the critical reflections that arise from the experience of the teacher trainer to meditate on the pedagogical meaning of the learning built throughout the activities.

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Learning by investigating: when mistakes stop interrupting learning

It is common for students to seek the teacher's help to clear up doubts and receive an immediate solution. Isso reflete experiências escolares onde o erro significa o fracasso que, atribuído ao aluno, faz do docente o detentor absoluto de saberes. However, over time, I noticed changes in this behavior. Now they observe the circuit, check connections, review the code, compare previous program versions, and test possibilities. The teams discuss hypotheses and justify choices, and even when they turn to the teacher, they generally offer significant alternatives. This is the scenario where the obstacle becomes part of the learning journey.

This perception dialogues with Piaget's (1975) understanding that cognitive development occurs when existing thought schemes no longer satisfactorily respond to situations faced by the subject, requiring successive reorganizations. The student is challenged to go beyond simple execution and produce cognitive balance. The correction of the error elaborates new hypotheses and produces more knowledge. No construcionismo, de Seymour Papert (1980), o erro não representa interrupção da aprendizagem, mas elemento constitutivo do próprio processo de construção do conhecimento. Building an artifact implies continuously experimenting, testing, revising, and perfecting what has been produced. In this, we also find examples by noticing that many go beyond simple execution. They want to analyze the behavior of systems when placed in situations different from those for which they were initially created.

Augmented cognition offers a fruitful interpretation for environments like Tinkercad, mBlock, and Arduino IDE. These are tools that facilitate intellectual experimentation. Simulating, visualizing, and modifying behaviors in real-time allows for analysis and reflection to critique the process and the product. Digital technologies do not replace thinking; in fact, they expand the conditions for it to develop in a more elaborate way (Vicentini *et al.*, 2025). The challenge is to stand before the questions long enough to build answers. It is in this scenario that the relationship with augmented cognition emerges, when technologies demand more complex reasoning.

Building autonomy

Over time, autonomously, some students began to ask questions different from the usual "Professor, is this correct?" or "Can I do it this way." Now instead of requesting an immediate answer, they seek to discuss possibilities: "What if we do it differently?", "Is the sensor installed

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correctly?", "What if we change this condition?". Getting the process right led to the search for understanding how the project itself works. I understood that offering quick answers interrupts the reflection process. So, I replaced answers with carefully formulated questions, encouraging argumentation and thus finding alternative paths

For Freire (1996), teaching does not mean transferring finished answers, but creating conditions for the learner to actively participate in the construction of knowledge. When taking on the responsibility of justifying a decision to colleagues, learning ceases to be mere reproduction and becomes an exercise in intellectual autonomy. In the construction of meaningful artifacts, Papert's constructivism (1980) is noted. The student, by applying the knowledge they acquire, produces new knowledge during the creation process itself. Tests conducted in workshops provide the perspective of augmented cognition as digital platforms offer rapid experiments, reducing the fear of making mistakes and encouraging the exploration of new strategies. This environment expands the investigation that would hardly occur with the same intensity in exclusively exhibition situations. Intellectual autonomy is not about independence, but about the capacity to collectively build knowledge. I understood the importance of problematizing to encourage a plurality of ideas.

When Disciplines Cease to Exist: The Interdisciplinarity That Emerges from Practice

In the Robotics Clubs of the LIRE Project, there is no concern with traditional school boundaries, thus, the Humanities and Exact Sciences areas complement each other to solve and build ideas. For example, the construction of line-following robots, understanding a mix of varied information. Instructions in another language, infrared sensor operation, programming construction, motor adjustment, lighting, and angular positioning. Everything arose and was treated as an inseparable part of the same process. Spontaneously, the problem or solution requires knowledge from different areas.

In this context, Seymour Papert (1980), by arguing that learning becomes more meaningful when organized around the construction of projects that make sense to the learner, becomes a contributor to this article. I notice that knowledge is no longer presented as a sequence of fragmented contents. In Robotics Clubs, diverse concepts were applied to build objects with personal meaning. The ideas of Mitchel Resnick (2017) when the author draws attention to learning environments where different knowledge areas cease to compete with each other and begin to collaborate in the construction of original solutions, are reminiscent of the

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sharing of learning among programming students, mechanical students, and many others collaborating with their potential. From the perspective of augmented cognition, this profile expands and favors analysis for the construction of connections between areas that are traditionally kept separate. It's not about knowing "what content to learn?" but "what do I need to understand?". Augmented cognition relates distinct knowledge to advance on complex topics.

From reproduction to authorship: when creation becomes part of learning

Facing the unknown, reproducing procedures offers fewer risks. However, as students become familiar with the available resources, they go beyond technical mastery and venture into the universe of changes and propose unusual functionalities. Today, the model loses meaning, because the reference is that with which each group and even individual identifies. Learning moves away from conservative fields and assumes an authorial dimension, distancing itself increasingly from preconceived examples. The objects became intellectual expressions in which each decision, adaptation, and solution deposited there, as a mark, identifies the deserved authorship for their creators.

When Resnick (2017) shifts the focus from content reproduction to the construction of meaningful experiences, it becomes clear that creative learning occurred in the Clubs. This is easily identifiable by the students' level of engagement. Papert's constructivism (1980) helps to understand this transformation. Building a meaningful artifact implies establishing a personal relationship with the object. The student materializes ideas that make sense to the learner. The object passed becomes a form of expression of the choices made. From the perspective of augmented cognition, the transition from reproduction to authorship teaches that the greatest indicator of learning is the ability to sustain a thesis, if necessary, until it needs to be reformulated, and thus advance to construct the object of desire.

Learning from others: socioemotional skills that emerge from collaboration

It is difficult for us to conduct all the stages of a process alone. Throughout the experience, divergences in strategy, impatience, difficulty listening, and a tendency towards division arise. Spontaneously, the students became collaborative and tolerant. The disagreements turned into opportunities to compare and argue.

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For Paulo Freire (1996), knowledge is built in the relationship between subjects who jointly investigate reality, mutually recognizing each other as active participants in the educational process. In this context, I realize that solutions emerge when distinct experiences and knowledge are put into dialogue. Mitchel Resnick (2017) highlights the appreciation of peers as an essential part of the learning process. Collaboratively developed projects share ideas. And here I also see the transformation when I witness teams interrupting their projects to assist colleagues, discuss alternatives, or simply observe how another group is solving a particular problem in order to solve their own. Often one person's mistake becomes another's success, and vice versa.

Under the light of augmented cognition, I identify different forms of mediation that end up facilitating the process of sharing experiences, which is so necessary for dealing with the complexity of human relationships and forming lasting partnerships and relationships. The reflections presented here are the honest observation of events capable of revealing the formative potential of experiences in which technology, pedagogical mediation, and collaborative learning are articulated around significant projects. It is precisely this situated, reflective, and contextualized nature that characterizes the present experience report.

Limits of the Report

The nature of this work requires that its possibilities and limits be explicitly stated. The interpretations presented here result from continuous observation in the daily lives of the Robotics Clubs of the LIRE Project and the dialogue between this experience and theoretical references in the field of Education. The situations described correspond to a specific context of the municipal education network of Brusque (SC), involving schools, students, teachers, and particular forms of pedagogical organization. For this reason, it is not intended to assert that similar experiences will necessarily produce the same effects in other educational scenarios. The reflections presented should be understood as interpretative possibilities constructed from a situated reality and not as conclusive evidence about the effects of educational robotics. It is also important to recognize that the author simultaneously occupies the positions of training professor and narrator of the experience. This condition produces privileged access to the daily life of workshops, allowing for the recording of aspects that would hardly be perceived by an external observer. At the same time, this proximity demands a permanent exercise of reflexivity,

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since every interpretation is crossed by the experiences, expectations, and choices of the one who directly participates in the practice being described.

Another limitation refers to the very concept of augmented cognition adopted in this article. It is not used as a category intended to measure or prove cognitive changes in students, but as a theoretical lens to interpret situations observed during the development of the workshops. The reflections presented seek to understand learning processes mediated by digital technologies, without establishing causal relationships between the use of robotics and the development of specific skills. Far from reducing the relevance of the report, acknowledging these limitations strengthens its scientific contribution. By clarifying the context of the experience, the author's position, and the scope of the interpretations produced, the manuscript maintains the rigor expected of an experience report and, at the same time, points to possibilities for future research that can deepen, through different methodological approaches, the issues discussed here.

Final considerations

When I started as a training teacher in the LIRE Project, I believed the biggest challenge would be teaching technology and logical reasoning. However, I understood that the necessary technical framework represents only the visible dimension of the experience. The transformative element of everyday workshops is not the objects built, but the way the community begins to think, investigate, dialogue, and build solutions to the global challenges encountered.

This perception of cognitive results is what motivated the preparation of this report. In addition to presenting a sequence of activities or describing projects developed, I seek to share a professional experience that has been modifying my understanding of the educational potential of robotics. Here I recognize observed processes that go beyond the technical domain of the technologies used. The construction of intellectual autonomy, the willingness to investigate problems, authorship in project development, collaboration among students, and the integration of knowledge from different areas constitute aspects that, today, guide my reflection on pedagogical practice. The concept of augmented cognition proves to be particularly fruitful as an interpretive category. Understanding learning as a result of the interaction between subject

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and technology is to classify the resources associated with this universe as instruments that favor more complex ways of thinking to construct modern knowledge.

The contributions of Piaget (1975), Papert (1980), Resnick (2017), and Freire (1996) are timeless and the foundation for interpreting this experience. Although distinct, these frameworks converge in recognizing that learning implies active participation, investigation, creation, dialogue, and the assignment of meaning to lived experiences.

The reflections presented in this article do not aim to offer ready-made models for the implementation of educational robotics. Its main contribution consists of sharing an experience built in public school, which shows how teaching practice can constitute a legitimate source for knowledge production, when subjected to critical analysis and dialogue with scientific literature.

In conclusion, I reaffirm my conviction that educational robotics is enhanced when it integrates pedagogical projects for human development. Technology expands collaborative research and gives meaning to knowledge. When mediated by planned pedagogical practices, technology becomes an instrument to broaden ways of thinking, learning, and building. Within an environment conducive to expressing ideas, the student develops skills that can be applied in all spheres of life. The greatest legacy for future generations is not just having created the model, but a collaborative environment based on truth and wisdom. Thus, society will make wise decisions aimed at the collective good.

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- **Conflicts of interest:** The author declares no financial or commercial conflicts of interest. For the sake of transparency, it is noted that the author serves as an instructor for the LIRE Project—the subject of this report—a role already disclosed in the methodology section as that of an "involved researcher."
- **Ethical approval:** This work is an experience report reflecting on the author's own teaching practice; it does not involve the collection of data from human subjects via research instruments (such as questionnaires, interviews, tests, or identifiable individual records). Consequently, it was not submitted to a Research Ethics Committee. The situations described are presented in an aggregated and anonymized format, ensuring the confidentiality and anonymity of the students and classes involved, in accordance with the ethical principles that guide educational work and academic scholarship.
- **Data and material availability:** As this is an experience report, the study did not generate datasets suitable for deposition or sharing. The reflections presented are based on the author's personal experience and observations during the Robotics Club activities. Additional information regarding the reported experience may be obtained from the author upon reasonable request.
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