FROM COMMAND TO CREATION: CHILDREN'S AGENCY IN EDUCATIONAL ROBOTICS EXPERIENCES IN EARLY CHILDHOOD EDUCATION

DO COMANDO À CRIAÇÃO: PROTAGONISMO INFANTIL EM EXPERIÊNCIAS DE ROBÓTICA EDUCACIONAL NA EDUCAÇÃO INFANTIL

DEL COMANDO A LA CREACIÓN: PROTAGONISMO INFANTIL EN EXPERIENCIAS DE ROBÓTICA EDUCATIVA EN LA EDUCACIÓN INFANTIL

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ABSTRACT: This study examines how educational robotics experiences developed through the Robótica Kids II continuing professional development program fostered children's agency and the reframing of pedagogical practices in early childhood education. This qualitative, applied study draws on Design-Based Research principles and involved 25 teachers from 16 municipal early childhood education centers in Brusque, Santa Catarina, Brazil. The analysis covers the program's first two modules, reflective records, lesson plans, and five participant observations in three classrooms, examined through content analysis. Findings suggest a shift from teacher-directed activities focused on reproducing predefined models toward more open-ended experiences that encourage exploration, creativity, and children's decision-making. They also indicate changes in teacher mediation, with greater emphasis on children's authorship and experimentation. The study concludes that continuing professional development and educational robotics can strengthen inquiry-based pedagogical practices centered on children's agency.

KEYWORDS: Educational robotics. Early childhood education. Children's agency. Teacher professional development. Creative learning.

***RESUMO**: Este estudo analisa como experiências de Robótica Educacional, desenvolvidas na formação continuada Robótica Kids II, favoreceram o protagonismo infantil e a ressignificação das práticas pedagógicas na Educação Infantil. Trata-se de pesquisa qualitativa, aplicada, fundamentada em princípios da Design-Based Research, com participação de 25 docentes de 16 unidades da rede municipal de Brusque (SC). O recorte contempla os dois primeiros módulos da formação, registros reflexivos, planejamentos e cinco observações participantes em três turmas, examinados por meio da Análise de Conteúdo. Os resultados apontam indícios de deslocamento de propostas diretivas, centradas na reprodução de modelos, para experiências mais abertas à exploração, à criação e à tomada de decisões pelas crianças. Também evidenciam mudanças na mediação docente, com maior valorização da autoria e da experimentação. Conclui-se que a formação continuada e a Robótica Educacional apresentam potencial para fortalecer práticas investigativas e centradas no protagonismo infantil.*

***PALAVRAS-CHAVE**: Robótica educacional. Educação infantil. Protagonismo infantil. Formação continuada de professores. Aprendizagem criativa.*

***RESUMEN**: Este estudio analiza cómo las experiencias de robótica educativa desarrolladas durante la formación continua Robótica Kids II favorecieron el protagonismo infantil y la resignificación de las prácticas pedagógicas en educación infantil. La investigación, cualitativa y aplicada, se fundamentó en principios de la investigación basada en el diseño (Design-Based Research) y contó con 25 docentes de 16 centros de la red municipal de Brusque (Santa Catarina, Brasil). Se analizaron los dos primeros módulos de la formación, registros reflexivos, planificaciones y cinco observaciones participantes en tres aulas, mediante análisis de contenido. Los resultados sugieren una transición desde propuestas dirigidas, centradas en reproducir modelos, hacia experiencias abiertas a la exploración, la creación y la toma de decisiones infantiles. También evidencian cambios en la mediación docente, con mayor valoración de la autoría y la experimentación. Se concluye que la formación continua y la robótica educativa pueden fortalecer prácticas investigativas centradas en el protagonismo infantil.*

***PALABRAS CLAVE**: Robótica educativa. Educación infantil. Protagonismo infantil. Formación continua del profesorado. Aprendizaje creativo.*

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Introduction

The transformations brought about by digital technologies have significantly impacted the ways of communication, interaction, and learning in contemporary society. In the educational context, especially in Early Childhood Education, these changes have been broadening discussions about pedagogical possibilities related to digital culture, creativity, and the development of computational thinking from the early school years.

In Brazil, the inclusion of Computing in Basic Education was strengthened by the National Common Curricular Base (BNCC), approved in 2017 (Brasil, 2017), and later with the BNCC Computing Complement, approved by Opinion CNE/CEB No. 2/2022 (Brasil, 2022), which recognizes Computing as a fundamental area for the development of competencies related to Computational Thinking, the Digital World, and Digital Culture. Furthermore, the National Digital Education Policy (PNED) (Brasil, 2023), established by Law No. 14.533/2023, reinforces the need to promote access to digital technologies and the development of digital competencies at all levels and modalities of education.

In this context, the Computing Training Frameworks for Basic Education, developed by the Brazilian Computing Society, highlight that Computing goes beyond technical teaching, involving practices related to problem-solving, creativity, knowledge construction, and critical understanding of the digital world (SBC, 2017).

Discussions related to computational thinking have also broadened the understanding of the use of technologies in Early Childhood Education. According to Brackmann (2017), computational thinking involves skills related to problem-solving, decomposition, pattern recognition, and strategy building, and can be developed through playful, creative, and contextualized experiences. Bers (2018), when discussing the development of computational thinking in childhood, highlights that young children learn computational concepts through play, exploration, and interaction with concrete materials and technologies appropriate for the child's context.

In this scenario, Educational Robotics is being understood as a possibility for the development of more investigative, creative, and collaborative pedagogical practices. Blikstein (2013) highlights that experiences related to the maker culture and artifact construction favor processes of authorship, experimentation, and active learning, bringing theory and practice closer in meaningful contexts.

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However, despite the advancement of educational technologies in the school context, many practices still remain centered on excessively directed proposals, in which children assume a predominantly reproductive role. In various situations, experiences related to robotics end up being limited to assembling predefined models, reducing the possibilities for children's imagination, exploration, and authorship.

The reflections developed in this study are based on a set of theoretical perspectives that dialogue with Early Childhood Education and the creative use of technologies. Papert's (2008) constructivist perspective understands learning as the active construction of knowledge through the creation of meaningful artifacts. To this, the notion of creative learning proposed by Resnick (2020), which values the processes of creating, playing, sharing, and reflecting, and the assumptions of the maker culture discussed by Blikstein (2013), which emphasize experimentation, authorship, and problem-solving, are articulated. In the field of computational thinking in childhood, Bers (2018) and Brackmann (2017) highlight that its learning occurs in a playful, contextualized manner and is integrated into children's interactions with materials and the environment. These perspectives constitute the lenses that guided both the organization of the training and the analysis of the experiences, sustaining the understanding of child protagonism as a possibility for choice, creation, investigation, and production of meanings.

This paper integrates part of the reflections developed in the context of the main author's master's research. The investigation is based on principles of Design-Based Research (DBR), a methodological approach characterized by the development of interventions in real contexts, through iterative processes of analysis and redesign, and by the articulation between the transformation of practice and the production of scientific knowledge (Barab; Squire, 2004).

Given this context, the question arises: in what way can Educational Robotics experiences in Early Childhood Education favor child protagonism and contribute to the construction of less directive pedagogical practices? Thus, the present study aims to analyze how Educational Robotics experiences developed in the context of the Robótica Kids continuing education favored child protagonism and contributed to the re-signification of pedagogical practices of early childhood education teachers.

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Methodology

The present study is characterized as a qualitative research, of an applied nature, developed from the principles of Design-Based Research (DBR). The choice of the qualitative approach is based on the understanding that educational phenomena involve meanings, experiences, perceptions, and relationships constructed by subjects in their contexts of action. According to Minayo (2014), qualitative research seeks to understand human and social processes in their complexity, considering the meanings attributed by participants to their experiences and the practices they develop.

Regarding its nature, the research is characterized as applied, as it seeks to produce knowledge aimed at understanding and resolving concrete problems in educational reality, with the potential to support the transformation of pedagogical practices (Gil, 2008). In this context, the study is linked to the continuing education of early childhood education teachers participating in the Robótica Kids project, developed by the Municipal Department of Education of Brusque (SC).

The research is based on principles of Design-Based Research (DBR), an approach initially proposed by Brown (1992) and Collins (1992) and later systematized by Barab and Squire (2004). DBR is characterized by the development of interventions in real learning contexts, articulating iterative cycles of planning, implementation, analysis, and redesign. Unlike approaches that are limited to describing phenomena, DBR seeks to understand and, simultaneously, transform educational practices, producing theoretical knowledge from the challenges encountered in the investigated contexts.

In the present investigation, Design-Based Research guides both the organization of the continuing education (Robotics Kids II) and the production and analysis of the data. The investigative process articulates two complementary contexts: the formative context, in which the experiences, study moments, reflective records, and plans developed by the teachers are elaborated; and the pedagogical practice context, in which these proposals are implemented in Early Childhood Education units and monitored by the principal researcher through participant observations, photographic records, and pedagogical documentation. The connection between these two contexts makes it possible to understand how the reflections produced during training impact the reorganization of teaching practices and, consequently, the learning experiences lived by children. In the context of this research, Design-Based Research was operationalized

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through cycles articulated between teacher training, implementation of proposals in school units, observation of pedagogical practices, and systematic moments of reflection and redesign.

The Robotics Kids training is a continuing education initiative promoted by the Municipal Secretariat of Education of Brusque (SC), within the scope of the Itinerant Laboratory of Educational Robotics (LIRE) (Silva *et al*., 2025), aimed at early childhood education teachers, with the objective of strengthening the integration of Educational Robotics, Digital Education, and Computational Thinking into pedagogical practices. Organized from practical experiences, moments of collective reflection, and the development of contextualized didactic proposals, the training seeks to foster the construction of experiences centered on children's active participation, creativity, investigation, and authorship, in line with the principles of the BNCC and the BNCC Computing.

Twenty-five teachers participated in this research cycle, belonging to 16 Early Childhood Education units of the Municipal Education Network of Brusque (SC). The continuing education course Robotics Kids II is structured into six in-person sessions, complemented by asynchronous activities developed in the Moodle virtual environment, totaling 80 hours. The offering of continuing education supported by a virtual learning environment and active methodologies integrates an already consolidated path in the Municipal Network of Brusque (Silva; Vicentini; Mayer, 2025). As the master's degree training and research (from which this work derives) are still under development, this article presents an analytical excerpt of the data produced in the first two modules, selected for bringing together reflective records, pedagogical planning, training experiences, and observations of the practices implemented by the teachers in their classes. Throughout this journey, the participants experienced practical activities, made reflective records, developed pedagogical plans, and implemented proposals in their classes, constituting the corpus analyzed in this investigation.

The master's research adopts Design-Based Research as a methodological approach to guide the planning, implementation, analysis, and redesign of continuing education. In this context, the data analyzed in this study correspond to an initial stage of the investigation, allowing for an understanding of the re-signification movements of pedagogical practices related to the promotion of child protagonism, without exhausting the analyses planned for the subsequent stages of the research.

In the two modules analyzed, the teachers participated in practical experiences, theoretical discussions, and moments of reflection on the pedagogical possibilities of Educational Robotics, Computational Thinking, and Digital Education in Early Childhood

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Education. The experiences were organized in light of the assumptions of constructivism and creative learning, valuing learning by doing, experimentation, exploration of materials, and children's authorship (Papert, 2008; Resnick, 2020).

Subsequently, the proposals developed during the training were implemented in the Early Childhood Education units and monitored by the researcher through participant observation. For this segment of the research, five participant observations were conducted in three Early Childhood Education classes belonging to the group followed by the research. Initially, the implementations carried out in the three classes after the first training module were observed. In the next stage, corresponding to the second module, the proposals developed in two of these classes were followed up, due to the non-implementation of the activity by the third teacher. The reflective records produced by the participants and the dialogues held throughout the training process complemented the analysis corpus. The analyzed data emerged especially from activities involving creative construction, simple circuits, maker robotics, and unplugged experiences.

Among the instruments for data production, the activity called "From Experience to Practice," developed at the end of the analyzed modules, stands out. In this activity, the teachers were challenged to develop pedagogical proposals for their classes based on the experiences lived during the training, specifying the learning objectives, the organization of activities, possible adaptations, and, especially, the strategies planned to foster child protagonism. The plans produced constituted an important corpus for analysis by demonstrating how the principles discussed in the training came to intentionally guide the organization of pedagogical practices.

The analysis considered two complementary levels of data, which highlight distinct aspects of the phenomenon investigated. At the teaching level, the reflective records and the lesson plans developed in the activity "From Experience to Practice" demonstrate the teachers' mediation and pedagogical intentionality, that is, the way they began to plan and justify experiences focused on child protagonism. In the context of classroom practice, participant observations, conducted in three Early Childhood Education classes after the first training module and in two of these classes after the second module, along with photographic records, provided evidence of the children's actions, interactions, and forms of participation during the development of the pedagogical proposals. The articulated reading of these two sources allowed for triangulation of what the teachers plan and reflect on with what was observed in the

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classrooms, supporting interpretations about the repercussions of the training on pedagogical practices.

The systematic treatment of the corpus gathered in this selection was carried out through Content Analysis (Bardin, 2016), developed in three stages: pre-analysis, material exploration, and treatment of results, inference, and interpretation. In the pre-analysis, the records were organized and a floating reading was performed. In the exploration of the material, the units of record related to child protagonism, teacher mediations, and the transformations of pedagogical practices were identified. The analytical categories were predominantly defined a priori, based on the theoretical perspectives mobilized in the study, especially constructivism (Papert, 2008) and creative learning (Resnick, 2020), and on the conjectures that guided the training, being refined in contact with the data. Finally, in the treatment, inference, and interpretation stage, the units were grouped into these categories and discussed in light of the adopted framework.

Thus, there are two perspectives operating on distinct and complementary levels: Design-Based Research constitutes the architecture of the investigation, in which the analysis occurs in a procedural and iterative manner: the readings produced throughout the meetings feed the collective reflection and the redesign of the proposals developed in the schools; Content Analysis, on the other hand, is the technique used for the retrospective and systematic examination of the corpus gathered in this segment, whose results support this same redesign movement. From this articulation, the categories related to child protagonism, directive practices, and experiences of creation and exploration in the context of Educational Robotics in Early Childhood Education resulted, as shown in Table 1.

Table 1 – Examples of record units, codes, thematic inferences, and analytical categories identified in the research

Registration unit	Initial code	Thematic inference	Analytical category
"By exploring, building, and testing their own ideas, children become active participants in their own learning."	Active participation	Children take a central role in learning	Childhood protagonism
Robotics can develop children's creativity, investigation, and leadership.	Childhood protagonism	Recognition of the child as an active and creative subject	Childhood protagonism
What most caught my attention in this module was the freedom to create.	Freedom to create	Valuing children's authorship and creativity	Creation and exploration
"Without rigid manuals, she becomes the author	Children's authorship	Production of own meanings and solutions	Creation and exploration

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of her own project and free to create."			
"The biggest difficulty was putting into practice something we didn't have as a model."	Overcoming predefined models	Break with reproductive proposals	Re-signification of pedagogical practices
"Allow the child to think, test, and even make mistakes."	Mediation for experimentation	Redefinition of the teaching role in favor of child autonomy	Re-signification of pedagogical practices

Source: Elaborated by the authors from the reflective records produced by the participants of the Robotics Kids II (2026) training.

Results and Discussion

The results presented in the following sections offer indications of transformations in pedagogical practices related to Educational Robotics, especially concerning child protagonism, teacher mediation, and children's creative possibilities. Subsection 3.1 presents analyses resulting from the observations made by the researcher in Early Childhood Education classes during the development of pedagogical proposals. Subsection 3.2 discusses the reflection and redesign of pedagogical practices carried out by the participating teachers throughout the continuing education.

From the stereotyped robot to free creation

The observations made during the development of the pedagogical proposals allowed for the identification of different forms of teacher mediation in experiences related to Educational Robotics in Early Childhood Education. In some classes, the proposals favored more open-ended experiences, in which children could freely explore materials, create narratives, and develop original productions. In other situations, however, the activities had a more directive character, leading the children to reproduce previously defined models.

In these more targeted experiments, children were often instructed to build "a robot," which in many cases resulted in similar productions, marked by standardized humanoid representations and little creative freedom. These situations highlighted practices still associated with a technocratic view of robotics, centered on the reproduction of structures considered correct.

This perspective distances itself from the approaches advocated by Papert (2008), who understands the use of technologies as an opportunity for creation, experimentation, and active

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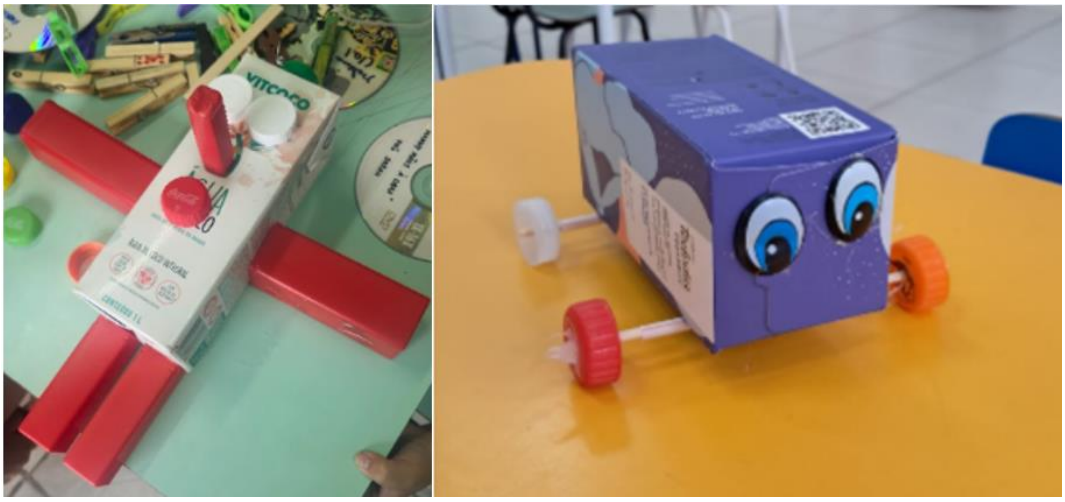
knowledge construction. Throughout the observations and discussions held during the training, teachers began to problematize their own pedagogical mediations, recognizing that excessive direction limited children's possibilities for imagination, authorship, and agency.

From these reflections, indications of the development of more open and exploratory proposals were observed, favoring experiences in which some children began to build structures inspired by animals, vehicles, and elements of nature, attributing their own narratives to the productions developed.

Figure 1 – Artifacts produced with reusable materials in Educational Robotics experiments



Source: Research archive (2026).

Figure 1 illustrates productions developed from reused materials, showing that the construction of artifacts was not centered on the reproduction of ready-made models, but on the creation of original solutions developed by the children. In this context, the construction process assumed greater relevance than the final product, favoring experiences of exploration, decision-making, and the assignment of meanings to the productions carried out.

Instead of just reproducing ready-made models, they began to experiment, imagine, and build narratives from their creations. This movement approaches the perspective of creative learning discussed by Resnick (2020), in which the process of creating, playing, sharing, and reflecting favors more meaningful and personal experiences.

Furthermore, the experiences also engage with the premises of the maker culture, understood by Blikstein (2013) as an opportunity to promote active learning, experimentation, and student protagonism through the creation of artifacts and problem-solving in meaningful contexts.

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Teacher mediation and redesign of pedagogical practices

The analyzed data suggest that the observed changes in pedagogical experiences may be related to the reflective movement promoted during continuing education. Upon analyzing their own practices, teachers began to realize that they often anticipated answers, excessively directed constructions, and limited children's experimentation processes.

This movement of analysis, reflection, and reorganization of practices approaches the assumptions of Design-Based Research, especially by understanding pedagogical practice as a space for investigation, intervention, and continuous redesign (Barab; Squire, 2004).

Throughout the formative process, indications were observed that some teachers began to adopt a less controlling and more investigative stance, valuing the creative processes, the hypotheses raised by the children, and the different forms of interaction with the materials. More than seeking standardized results, experiences have begun to prioritize play, curiosity, authorship, and learning through experimentation.

In this context, Bers (2018) highlights that the development of computational thinking in childhood should occur in an integrated way with playful experiences and children's meaningful interactions with the environment, respecting the specificities of Early Childhood Education. Similarly, Brackmann (2017) emphasizes that computational thinking can be developed through creative, collaborative, and contextualized activities, not being restricted to the use of computers or programming languages.

The proposals analyzed favored experiences in which children could explore diverse materials, test possibilities, modify constructions, and share ideas collectively.

An example of this change in perspective can be observed in a proposal developed by a teacher participating in the Robotics Kids II training. The activity was organized in two stages: initially, the children explored discarded electronic equipment, observing its components, dismantling parts, and identifying materials suitable for reuse. Next, they participated in the collective construction of a technological prototype using the elements selected during the investigation.

Unlike proposals focused on the reproduction of predefined models, the experience prioritized exploration, hypothesis formulation, and decision-making by the children themselves. During the activity, they were able to manipulate materials, discuss construction possibilities, and participate in choices related to the prototype's structure and appearance.

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The images presented in Figure 2 illustrate moments of this investigative process, highlighting the active participation of the children in exploring the materials and in the collective construction of the project.

Figure 2 – Exploration of electronic equipment and investigation of reusable components in Educational Robotics activity in Early Childhood Education



Source: Research archive (2026).

Figure 2 illustrates moments of exploration and investigation carried out by the children during the activity, suggesting that the proposal prioritized direct interaction with the materials, hypothesis formulation, and the discovery of possibilities for reusing electronic components, fostering experiences of authorship, experimentation, and active participation in the construction processes.

The observed evidence approaches Papert's (2008) constructivist perspective, by valuing learning through the construction of meaningful artifacts. Similarly, Resnick (2020) highlights that experiences based on creation, experimentation, and sharing foster more significant learning and the development of creativity. In this context, there are indications of child protagonism not only in the construction of the final product, but also in the possibilities of investigating, choosing, testing, and assigning meanings to their own productions.

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Child protagonism as pedagogical intentionality

The analysis of the plans developed by the participants in the activity "From Experience to Practice" allowed for the identification of re-signification movements in pedagogical practices related to the promotion of child protagonism. The analyzed records indicate that teachers began to plan experiences in which children assume an active role in learning processes, participating in decisions, formulating hypotheses, creating strategies, and exploring different possibilities for action. Records suggest an expansion of the understanding of child agency, which has begun to more intentionally guide the organization of some of the proposals developed for Early Childhood Education.

This change became evident in the activity "From Lived Experience to Practice," in which the participants were challenged to transform the experiences lived during the training into concrete proposals for their classes. When describing where they identified child protagonism in their activities, the teachers highlighted aspects related to decision-making, strategy creation, active participation in play, problem-solving, authorship, and collaboration among children.

In one of the proposals, focused on the development of computational thinking, the participants highlighted that protagonism was manifested when children "make group decisions," "choose strategies," "experiment with solutions," and "build collective agreements." In another activity, related to digital culture, it was evidenced that the child "chooses what to create," participates in the construction of agreements, and actively interacts with technology, assuming the role of creator and not just consumer. These records indicate a shift from proposals focused on task execution to experiences that value children's participation in building learning paths.

The results suggest that the training favored reflection processes on the child's role in Educational Robotics and Digital Education experiences. In this context, child protagonism began to be understood not only as participation in activities previously organized by adults, but as a possibility for choice, creation, investigation, and production of meanings. This understanding aligns with the perspectives advocated by Papert (2008) and Resnick (2020), recognizing that learning becomes more meaningful when children have opportunities to create, experiment, share ideas, and build projects that make sense to them.

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When challenged to transform their training experiences into concrete proposals for their classes, the teachers began to explicitly include in their lesson plans situations that favor children's decision-making, strategy creation, investigation, collaboration, and authorship.

Table 2 – Evidence of child protagonism identified in the plans developed by the teachers

Evidence of leadership	**Examples identified in the planning**
Decision-making	Choice of strategies, paths, and solutions
Authorship	Creation of digital drawings, stories, and artifacts
Investigation	Exploration of technological objects and materials
Troubleshooting	Construction of paths, challenges, and hypotheses
Collaboration	Collective construction of agreements and projects
Experimentation	Tests, errors, and reformulation of ideas

Source: Prepared by the authors based on records produced in the activity "From Experience to Practice" (2026).

The evidence presented in Table 2 suggests that child agency has come to occupy a more explicit place in the plans developed by the participants, configuring itself as a guiding principle for the experiences proposed to the children. It is observed that the participants began to foresee situations in which children can make decisions, develop strategies, formulate hypotheses, and actively participate in the construction of learning paths. This movement suggests an expansion of the understanding of the child's role in Educational Robotics, shifting the focus from task execution to active participation in the processes of creation, investigation, and problem-solving.

The results discussed in this excerpt of the research suggest that the formative experiences analyzed favored processes of reflection on pedagogical practices and expanded the possibilities for integrating Educational Robotics into Early Childhood Education through proposals that were more open to children's creation, investigation, and participation. These findings indicate the potential of continuing education to promote re-signification movements in teaching practices, an aspect that will be revisited and discussed in the final considerations of this study.

Final considerations

The analyses developed in this research segment suggest that Educational Robotics has the potential to foster more creative, investigative, and child-centered pedagogical practices in

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Early Childhood Education. In the context of the continuing education program Robotics Kids II, it was possible to identify indications of movements of reflection, analysis, and re-signification of pedagogical practices related to the use of educational technologies.

The analyzed data indicate that part of the proposals initially presented more directive characteristics, leading children to reproduce previously defined models and limiting possibilities for creation and experimentation. Throughout the training, however, signs of reorganization of pedagogical mediations were observed, with the development of more open, exploratory experiences centered on children's participation.

The results of this study also suggest that, when understood beyond a technical or instrumental perspective, Educational Robotics can constitute a language for children's expression, fostering experiences in which children create, explore, formulate hypotheses, and construct meanings from their own productions. From this perspective, educational technologies are understood as resources that can enhance more meaningful and contextualized learning experiences.

The discussions presented also reinforce the relevance of continuing education to promote reflection processes on pedagogical practices and expand the possibilities for integrating Educational Robotics into Early Childhood Education in line with the principles of creative learning, constructivism, and the maker culture. The analysis and redesign movements identified throughout the training are consistent with the principles of Design-Based Research, although the analyses resulting from subsequent stages of the investigation may broaden the understanding of these processes.

As this is a segment of a master's research still under development, the results presented do not exhaust the possibilities for analysis. The next steps of the investigation will allow for a deeper understanding of the re-signification processes of pedagogical practices and the contributions of Educational Robotics to the promotion of child protagonism in Early Childhood Education.

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CRediT Author Statement

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- **Ethical approval:** This research is part of a master's project titled "Robótica Kids: Ressignificando a Formação e a Prática dos Professores na Educação Infantil" (Kids' Robotics: Re-signifying Teacher Training and Practice in Early Childhood Education), which was approved by the Research Ethics Committee (Opinion No. 8,263,279; CAAE: 95473726.1.0000.0120). The investigation adhered to the ethical principles set forth in CNS Resolution No. 510/2016, ensuring the voluntary participation of the subjects, the protection of participants' identities, and the use of data exclusively for academic and scientific purposes.
- **Data and material availability:** The data and materials used in this research are held by the researchers and are linked to the master's project "Robótica Kids: Ressignificando a Formação e a Prática dos Professores na Educação Infantil." Due to the presence of information that could potentially identify participants, the data are not available in public repositories. However, anonymized versions of some materials may be made available upon request to the authors, provided that the ethical principles that guided the research are upheld.
- **Author contributions:** Fabiana Coronel da Silva: conceptualization, methodology, investigation, data curation, and writing (original draft). André Luís Alice Raabe: conceptualization, supervision (review and editing). Franciele Márcia Mayer: investigation and writing (review and editing). Taiani Vicentini: investigation, formal analysis, and writing (review and editing). Ivanete Lago Groh: investigation and writing (review and editing).

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