COMPUTATIONAL THINKING AND TEACHER TRAINING: CONTRIBUTIONS TO THE USE OF TECHNOLOGIES IN EDUCATION

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ABSTRACT

This research analyzed the impact of computational thinking on teacher training and its contributions to the use of technologies in education. The objective was to examine how the incorporation of this concept in teacher training can improve the use of digital technologies and transform pedagogical practices. To this end, a literature review research was carried out. The results showed that computational thinking provides educators with skills to solve problems, create innovative solutions, and utilize technologies more effectively. Computational thinking in education promotes the adoption of innovative pedagogical methodologies, such as project-based learning and gamification, which make teaching more interactive and personalized. The analysis concludes that teacher training that incorporates computational thinking not only improves the effectiveness of teaching, but also better prepares students for a technological future, developing critical and problem-solving skills essential for their professional and personal training.

Keywords: Technologies, Computational thinking, Education.

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INTRODUCTION

Computational thinking, a concept that refers to the ability to solve problems, design systems, and understand human behavior using the principles of computer science, is emerging as an essential competency in teacher education. This concept goes beyond the simple ability to program and becomes a problem-solving paradigm that can be applied in various disciplines and educational contexts. With the increasing integration of digital technologies in the classroom, computational thinking becomes a fundamental tool to enable teachers to explore and use these technologies effectively, promoting a more dynamic teaching adapted to the needs of the twenty-first century (Caratti; Vasconcelos, 2023).

Historically, the role of technologies in education has been predominantly focused on supporting and optimizing traditional pedagogical practices. However, digital transformation is reconfiguring the way knowledge is transmitted and acquired, making it necessary for teachers to develop skills to not only use, but also understand the technologies that integrate their classes. Computational thinking offers a theoretical and practical basis that allows educators to explore the potential of digital tools and adopt innovative methodologies that favor more meaningful and engaging learning (Costa; Coast; Vieira Junior, 2023).

Teacher training has traditionally focused on mastering pedagogical content and methods, often leaving aside the skills needed to effectively integrate technology into educational practice. However, computational thinking can bridge this gap by offering a structured approach to solving complex problems and creating practical solutions, using technological tools. This set of skills helps teachers design activities that promote students' interaction with technologies in a critical and creative way, fostering a more interactive learning environment adapted to current demands (Linhalis et al., 2024).

Thus, the objective of this research was to analyze computational thinking in teacher training and the contributions to the use of technologies in education.

DEVELOPMENT

TECHNOLOGIES IN EDUCATION AND COMPUTATIONAL THINKING

The advancement of digital technologies has profoundly transformed the educational landscape, offering new opportunities to enrich the teaching-learning process. In this context, computational thinking emerges as an essential approach for teacher training, integrating in an innovative way the use of technologies in education. Computational thinking, which involves the ability to solve problems, design systems, and understand

processes through the principles of computer science, goes beyond programming and applies to a wide range of pedagogical and administrative activities (Fantinati; Rosa, 2021).

The incorporation of digital technologies in classrooms enables more interactive and adaptive teaching methods, but it also requires educators to be able to use these tools effectively. Computational thinking offers a framework for teachers to not only utilize technologies, but also understand how these tools can be employed to solve problems and create innovative pedagogical solutions. This means educators need to go beyond simply using apps and devices; they must be able to integrate computational logic and critical analysis into their teaching practices (Caratti; Vasconcelos, 2023).

Historically, teacher education has focused primarily on mastering traditional content and methodologies, often neglecting the need for specific skills for technological integration. However, as digital tools become increasingly ubiquitous, the ability to think computationally becomes crucial. It allows educators to plan activities that not only use technologies effectively, but also develop digital skills in students, preparing them for a world that requires problem-solving skills and creativity (Cenci; Kist, 2024).

In addition to improving teachers' ability to use technologies, computational thinking fosters the development of transversal skills in students, such as logic, critical analysis, and complex problem solving. These skills are essential to meet the challenges of a digitized and interconnected society. Therefore, teacher training that incorporates computational thinking not only improves the effectiveness of teaching, but also empowers students to be critical thinkers and problem solvers in the future (Fantinati; Rosa, 2021; Flowers; Lee; Mansur, 2023).

TEACHER TRAINING: CONCEPTS AND APPROACHES

Teacher education is a complex field and essential to ensure quality education, covering both the initial preparation and the continuous development of teachers. This process involves a series of concepts and approaches that shape the pedagogical practice and professional training of educators. The initial training, received during the academic period, provides the theoretical and practical foundations necessary for the exercise of the profession. Continuing education, on the other hand, refers to learning throughout the career, through refresher courses, training and other opportunities that allow teachers to improve their skills and adapt to new educational demands (Gomes; Borges; Machado, 2021).

Several pedagogical approaches influence teacher training, each bringing different perspectives and teaching methods. The traditional approach, for example, focuses on the

direct transmission of knowledge, while the constructivist approach, influenced by theorists such as Jean Piaget and Lev Vygotsky, emphasizes the active construction of knowledge by the learner through interaction and reflection. These approaches are crucial in teacher education, as they determine how teachers plan and implement their pedagogical practices, directly impacting the learning environment (Gomes; Nogueira, 2023).

In addition to pedagogical approaches, modern teacher training seeks to develop specific competencies and skills in teachers. Skills such as classroom management, planning, and evaluation are essential for effective teaching practice. With the advancement of educational technologies, the ability to integrate these tools into the teaching process becomes increasingly important. Thus, teacher training is not limited to theoretical knowledge, but also prepares teachers to face the practical challenges of the school environment (Caratti; Vasconcelos, 2023).

Another important aspect of teacher training is the development of teachers' social and emotional skills. The ability to understand and respond to students' emotional and social needs is critical to creating a positive and inclusive learning environment. Socio-emotional skills, such as empathy and resilience, are essential for educational success and for the well-being of both teachers and students (Cenci; Kist, 2024).

Currently, teacher education faces significant challenges, such as the need to integrate new technologies, adapt to curricular changes, and deal with the growing diversity in classrooms. Current trends, such as the emphasis on inclusive education, the development of critical thinking, and the incorporation of active learning methodologies, are key to ensuring that teachers are prepared for an ever-evolving educational environment. In this way, teacher training is a dynamic process that seeks to equip educators with the tools and knowledge necessary to provide a high-quality education adapted to the needs of the modern world (Linhalis et al., 2024).

COMPUTATIONAL THINKING IN TEACHER TRAINING AND CONTRIBUTIONS TO THE USE OF TECHNOLOGIES IN EDUCATION

Computational thinking, a fundamental concept in the digital age, is increasingly integrated into teacher training, bringing significant contributions to the use of technologies in education. This approach, which involves skills such as problem decomposition, pattern identification, abstraction, and algorithmic creation, is not limited to programming, but offers a set of tools and strategies that can be applied widely in the educational environment. The incorporation of computational thinking in teacher education allows them to develop new

ways of approaching teaching and learning, making the most of the available technologies (Oliveira; Souza, 2020).

One of the main contributions of computational thinking to the use of technologies in education is the ability to create more interactive and personalized learning experiences. With computational thinking, teachers can develop activities that involve solving real problems and applying concepts practically, using digital tools to support and enrich the learning process. This approach promotes more active student participation, encourages critical thinking, and allows educators to personalize teaching according to the individual needs of students (Costa; Coast; Vieira Junior, 2023).

In addition, computational thinking promotes the inclusion of innovative methodologies in the classroom. Methodologies such as project-based learning and gamification benefit from computational thinking, as they involve creating challenges and building solutions that are inherently aligned with the principles of computer science. This not only makes teaching more engaging and relevant, but also helps students develop problem-solving and critical thinking skills, which are essential for success in an increasingly technology-driven professional environment (Caratti; Vasconcelos, 2023).

Another important aspect is that computational thinking contributes to the continuous training of teachers. By adopting this approach, educators are better equipped to adapt to rapid changes in the field of technology and new educational tools. This allows for a constant updating of pedagogical practices and the improvement of teaching strategies, ensuring that teachers remain relevant and effective in the use of digital technologies in their classes (Linhalis et al., 2024; Olive tree; Souza, 2020).

Thus, the integration of computational thinking in teacher training offers a series of benefits that go beyond the simple use of technologies. It enables teachers to develop problem-solving skills, create more interactive and personalized learning experiences, and adopt innovative pedagogical methodologies. In this way, computational thinking not only enriches pedagogical practice, but also prepares students for a future in which digital and problem-solving skills will be increasingly valued (Cenci; Kist, 2024).

FINAL CONSIDERATIONS

The objective of this research, which was to evaluate the contributions of computational thinking to the use of technologies in education, was achieved. The results demonstrate that the incorporation of this concept in teacher education not only improves the ability of educators to use digital tools more effectively, but also transforms the pedagogical and methodological approach in the classroom.

Computational thinking offers a solid foundation for solving complex problems and creating innovative solutions. It manifests itself in practical skills such as decomposing problems, identifying patterns, and creating algorithms, which go beyond programming and are applicable in various educational contexts. With these skills, teachers are able to integrate technologies in a more critical and creative way, enriching the learning experience of students and promoting a more interactive educational environment adapted to the needs of the twenty-first century.

In addition, computational thinking promotes the adoption of innovative pedagogical methodologies, such as project-based learning and gamification. These approaches not only make teaching more engaging, but also help students develop essential competencies such as problem-solving and critical thinking, skills that are indispensable for their future professional and personal development.

Therefore, the integration of computational thinking in teacher training represents a significant evolution in education, preparing teachers to face the challenges of the digital age and ensuring that they can provide teaching that prepares students for a technological and interconnected future. Teacher training, by embracing computational thinking, not only improves the effectiveness of teaching, but also contributes to the creation of a generation of students who are better equipped for the challenges and opportunities of the digital world.

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