TEACHER TRAINING AND COMPUTATIONAL THINKING: STRATEGIES FOR THE IMPLEMENTATION OF TECHNOLOGIES IN EDUCATION

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ABSTRACT

The research aimed to analyze strategies for the implementation of technologies in education, focusing on teacher training and computational thinking. The methodology used was a literature review, covering sources such as SciELO, Google Scholar, Scopus and Web Of Science. The results indicate that the continuous training of teachers is crucial for the effectiveness in the integration of educational technologies, allowing a more meaningful application and aligned with pedagogical objectives. Computational thinking emerges as an essential skill, facilitating structured problem-solving and the innovative integration of digital tools. The analysis highlights that successful implementation of technologies requires an initial assessment of needs, continuous training of educators, careful selection of tools and effective integration into the curriculum. In addition, cultural transformation in schools, promoted by teacher training and computational thinking, is essential to create a dynamic and adaptable educational environment, preparing students for a future with a growing demand for digital and problem-solving skills. It is concluded that the combination of these strategies offers a robust approach to adapting to technological changes, ensuring deeper and more meaningful teaching.

Keywords: Teacher training, Computational thinking, Technologies, Education, Learning.

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INTRODUCTION

Teacher training is a fundamental aspect for the evolution of education, especially in a scenario where digital technologies become increasingly integrated into the school environment. Continuous training of teachers is essential for them to be able to effectively use the technological tools available and thus improve the quality of teaching. In the current context, computational thinking emerges as a crucial skill for educators, not only as a content to be taught to students, but also as a necessary skill for teachers to integrate technology into their pedagogical practices in an innovative and efficient way (Cardoso; Almeida; Silveira, 2021).

Computational thinking refers to the ability to solve problems in a logical and structured way, similar to the process used in computer science. This approach involves the ability to break down complex problems into smaller parts, identify patterns, develop algorithms, and test solutions. For teachers, computational thinking not only helps in the organization and planning of classes, but is also a skill that can be applied in the use and integration of educational technologies. Incorporating these practices into the teacher training curriculum prepares teachers to face the challenges of the digital age and to use technologies in a more strategic and productive way (Lourenço; Cardoso Junior, 2022).

Effective implementation of technologies in education requires more than just access to digital tools. It is necessary for educators to be able to integrate these technologies in a meaningful way in the teaching and learning process. Teacher training focused on computational thinking offers teachers not only technical knowledge, but also pedagogical strategies to apply these tools in a way that really benefits students. This includes the ability to design activities that encourage critical thinking, collaboration, and creative problem-solving, essential elements for enriching learning adapted to the needs of students (Costa Júnior et al., 2023).

In addition, teacher training in computational thinking can promote a cultural change within schools, encouraging a more innovative and experimental approach to the use of technology. By empowering teachers with these skills, it is possible to create a more dynamic educational environment, where technology is seen as an ally in the teaching process, rather than a mere complement. This cultural transformation can lead to a broader and more effective adoption of technologies, benefiting both educators and students (Oliveira; Souza, 2020).

Therefore, the intersection between teacher training and computational thinking is crucial for the evolution of education in the twenty-first century. As technologies become increasingly present in students' lives, preparing teachers to use them effectively and

strategically becomes essential. Developing competencies in computational thinking allows educators not only to integrate technologies in innovative ways, but also to prepare students for a future where digital and problem-solving skills will be increasingly valued. This process of training and adaptation is essential to ensure an education that not only keeps up with technological changes, but also uses them to promote deeper and more meaningful learning (Silveira; Fabri, 2020).

Thus, the objective of this research was to analyze the strategies for the implementation of technologies in education, taking into account teacher training and computational thinking in this context. The research was carried out through a literature review, encompassing, therefore, the survey of articles in databases such as SciELO, Google Scholar, Scopus and Web Of Science.

DEVELOPMENT

TEACHER TRAINING

Teacher training is an essential and ongoing process that aims to equip educators with the skills, knowledge and skills necessary to promote quality teaching that is tailored to the needs of students. This process is not limited to initial preparation for teaching, but also encompasses continuous training and professional development throughout the teaching career, and is essential to ensure that teachers can face the challenges and demands of an ever-evolving educational environment (Cardoso; Almeida; Silveira, 2021).

Initial training is the first stage of educators' professional development, which usually takes place in higher education institutions such as colleges and universities. During this period, prospective teachers are provided with a solid theoretical and practical foundation, covering a wide range of educational disciplines and methodologies. In addition to theoretical classes, initial training includes practical internships, where candidates have the opportunity to apply the knowledge acquired in real classrooms, under the supervision of experienced professionals. This stage is crucial to prepare educators for the demands of teaching practice and to provide a deep understanding of the teaching and learning process (Costa Júnior et al., 2023).

Continuing education, in turn, is vital for teachers to be able to constantly update their knowledge and skills throughout their career. With the rapid changes in society and technology, as well as the evolution of pedagogical practices, educators need regular opportunities to improve their skills. This can include improvement courses, workshops, conferences, and seminars. Continuing education allows teachers to stay informed about new methodologies, educational technologies and recent research, as well as offering

support for the development of specific skills, such as the use of digital tools or advanced assessment techniques. This aspect of training helps educators to adapt to the new demands of teaching and to continuously improve their practices (Lourenço; Cardoso Junior, 2022).

The professional and personal development of teachers is another important component of teacher education, which goes beyond pedagogical skills. This aspect includes the promotion of personal growth, the development of leadership skills, and the ability to critically reflect on teaching practice. Educators are encouraged to set professional goals, seek mentorship, and participate in communities of practice where they can share experiences and learn from peers. This development contributes to teaching effectiveness and strengthens motivation and job satisfaction, helping teachers to remain engaged and committed to their profession (Cardoso; Almeida; Silveira, 2021).

In the current context, teacher training needs to respond to the demands of a digital and globalized society. This includes preparing teachers to integrate digital technologies into teaching, promote digital literacy, and teach essential skills for the twenty-first century, such as critical thinking, collaboration, and problem-solving. The training should address the skills needed for the effective use of emerging technologies, such as online learning tools, educational software, and digital collaboration platforms. In this way, teachers are empowered to create engaging and adaptive learning experiences that meet the needs of modern learners (Oliveira; Souza, 2020).

Finally, the evaluation of the effectiveness of teacher training is crucial to ensure that training programs are meeting their objectives and to identify areas that need improvement. This involves collecting feedback from participants, analyzing students' academic results, and reviewing pedagogical practices. Based on these evaluations, adjustments can be made to improve training programs, ensuring that they are aligned with the needs of educators and current educational standards. Continuous improvement is essential to maintain the relevance and quality of teacher training, ensuring that teachers are always well prepared to offer quality teaching and to adapt to the changes and challenges of the modern educational environment (Santos; Sá, 2021).

COMPUTATIONAL THINKING

Computational thinking is an approach that stands out for its ability to solve problems in a logical and structured way, similar to the processes used in computer science. This concept goes beyond the simple use of computers and encompasses a set of skills and strategies that can be applied in various areas of knowledge and in everyday situations.

Essentially, computational thinking involves the ability to break down complex problems into smaller parts, identify patterns, create algorithms, and test solutions, allowing a systematic approach to solving challenges (Lourenço; Cardoso Junior, 2022).

The practice of computational thinking begins with problem decomposition, which consists of dividing a large and complex problem into more manageable and smaller parts. This process makes it easier to understand and address the problem more effectively. The identification of patterns remains a crucial step, as it allows the recognition of similarities and regularities between different problems, helping to create generalized solutions that can be applied to similar situations (Cardoso; Almeida; Silveira, 2021).

Algorithm development is another core component of computational thinking. Algorithms are sequences of well-defined steps that guide problem solving. By creating an algorithm, it is possible to structure a solution in a clear and logical way, which not only makes it easier to solve problems but also makes the process more efficient and reproducible. In addition, the testing and debugging stage is essential to validate and improve the algorithm, ensuring that it works as expected and solves the problem appropriately (Oliveira; Souza, 2020).

Computational thinking also promotes the ability to think critically and creatively. When facing a problem, individuals are encouraged to explore different approaches and possible solutions, reflecting on the effectiveness of each of them. This aspect of computational thinking is particularly valuable in the educational context, as it encourages students to develop problem-solving skills and apply logical reasoning in various situations (Lourenço; Cardoso Junior, 2022).

In the educational realm, computational thinking is not limited to teaching programming, but encompasses a wide range of skills that are essential for students' cognitive development. Integrating computational thinking into the school curriculum can promote a more effective and innovative approach to learning, preparing students to face complex and dynamic challenges in the future. In summary, computational thinking is a critical competence that combines logic, creativity, and strategy for problem-solving, and its development is essential to enable individuals to face the demands of the twenty-first century effectively (Costa Júnior et al., 2023).

STRATEGIES FOR THE IMPLEMENTATION OF TECHNOLOGIES IN EDUCATION

The implementation of technologies in education is a complex process that requires careful strategic planning to ensure that digital tools are effectively and beneficially integrated into the teaching environment. For technology to truly transform education and

improve teaching and learning processes, several strategies must be adopted (Santos; Sá, 2021).

First, it is essential to conduct a detailed assessment of the needs of the school or educational institution and set clear objectives before incorporating any technology. This evaluation should consider the profile of the students, the skills of the teachers and the available resources. Identifying specific needs helps to choose the most appropriate tools and platforms, as well as ensuring that the technology adopted is aligned with the institution's educational goals. A well-founded strategic planning provides a solid foundation for the successful integration of technology (Cardoso; Almeida; Silveira, 2021).

Next, teacher training is crucial to the success of the technology implementation. Educators play a key role in the integration of technology, and their ongoing training and technical support are essential. Offering training that addresses both the technical use of the tools and the best pedagogical practices for their application helps teachers feel comfortable and prepared to use technologies effectively. Creating an environment of support and encouragement can facilitate teachers' adaptation to technological changes (Oliveira; Souza, 2020).

The selection and implementation of digital tools and resources should be made based on criteria such as usability, cost-effectiveness, and alignment with educational objectives. Tools such as learning management platforms, educational applications, and multimedia resources should be chosen considering their functionalities and the ability to meet the specific needs of the institution. Implementation should be gradual, starting with a pilot project to test the effectiveness of the tools before wider adoption, ensuring a smoother integration adjusted to the realities of the school environment (Lourenço; Cardoso Junior, 2022).

Additionally, integrating technologies into the curriculum is essential to ensure that they have a positive impact on learning. This means that digital tools should complement and enrich existing teaching methods, and not just replace traditional practices. Educators should plan activities and projects that take advantage of technologies and are aligned with pedagogical objectives. Effective curricular integration transforms technology into a natural and valuable part of the teaching and learning process (Costa Júnior et al., 2023; Scott; Fabri, 2020).

After implementation, it is necessary to continuously monitor and evaluate the impact of technologies on teaching and learning. Collecting feedback from faculty, students, and other stakeholders, as well as analyzing academic results and student engagement, helps to identify areas that need adjustments and improvements. This continuous evaluation

allows you to adjust and update practices to maintain the effectiveness of the tools adopted. In addition, fostering collaboration among educators, creating opportunities to share experiences and knowledge about the use of technologies, can promote a collaborative and innovative environment, strengthening implementation and encouraging creativity in the use of digital tools (Cardoso; Almeida; Silveira, 2021).

FINAL CONSIDERATIONS

The conclusion of this research, which addressed teacher training and computational thinking, focusing on strategies for the implementation of technologies in education, highlights the importance of an integrated and well-planned approach to ensure success in the adoption of digital tools in the school environment. The analysis shows that teacher training is a crucial element for the adaptation and effectiveness in the use of educational technologies. Trained teachers are able to integrate technology in a more meaningful way and aligned with pedagogical objectives, which, in turn, enriches the teaching and learning process.

Computational thinking, as a fundamental skill for educators, offers a solid foundation for solving problems in a structured and logical way. This competency not only facilitates the integration of technologies, but also promotes a more analytical and creative approach in creating educational activities and solutions. Thus, computational thinking becomes an essential component in teacher education, preparing teachers to use technologies in an innovative and efficient way.

The research also highlights that the successful implementation of technologies in education requires a comprehensive strategy. Initial needs assessment, ongoing training of educators, careful selection of digital tools, and effective integration of these tools into the curriculum are key steps in ensuring that technologies truly contribute to learning. Integration should be gradual and carefully monitored, with adjustments based on feedback and results to maximize the benefits of the technologies.

In addition, cultural transformation in schools, driven by teacher training and computational thinking, is an important aspect for the success of technological implementation. Encouraging an innovative and experimental approach to the use of technology helps to create a more dynamic and adaptable educational environment. This not only improves the quality of teaching, but also prepares students for a future where digital and problem-solving skills are increasingly valued.

In summary, the objective of the research was to meet the need to understand how teacher training and computational thinking can be effective strategies for the

implementation of technologies in education. The integration of these strategies provides a more robust approach adapted to the demands of the twenty-first century, ensuring that both educators and students benefit from technological innovations in an effective and enriching way. The continuous training of teachers and the application of computational thinking are therefore fundamental to create an education that not only keeps up with technological changes, but also uses them to promote deeper and more meaningful learning.

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