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ACTIVE METHODOLOGIES AND TECHNOLOGIES IN EDUCATION

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ABSTRACT

The objective of this research was to analyze the opportunities and impacts of the use of active methodologies and technologies in education, aiming to understand how these approaches can transform the teaching-learning process. The methodology adopted was a bibliographic research, which involved the review of academic studies, articles and books on the main active methodologies, such as problem-based teaching (PBL), project-based learning (PBL), the flipped classroom and gamification, and on the use of digital technologies in education, such as online platforms, artificial intelligence and augmented reality. The results indicated that, when integrated, active methodologies and technologies offer several opportunities, such as increasing student engagement, personalizing learning, fostering collaboration, and developing essential skills for the 21st century, such as autonomy and critical thinking. In addition, technological tools enable more efficient educational management, facilitating continuous assessment and real-time feedback. However, the survey also identified challenges, such as the lack of adequate infrastructure and inequality in access to technologies, which need to be overcome to ensure the inclusion of all students. The conclusion highlights that the combination of active methodologies and technologies has the potential to transform education, making it more dynamic, inclusive and aligned with the needs of a digital society, as long as it is accompanied by public policies that promote access and teacher training.

Keywords: Education. Active Methodologies. Technology.

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INTRODUCTION

Active methodologies and the use of technologies in education emerge as themes of great relevance in the contemporary educational context. Technological advancement, combined with new pedagogical approaches, has radically transformed the teaching-learning environment, providing greater interaction, autonomy and protagonism of students. Over the past few years, education has sought to adapt to the demands of an increasingly digital society, which requires new forms of teaching that are more dynamic, inclusive, and effective. The concept of active methodologies refers to strategies that involve the student directly in the learning process, as opposed to the traditional teaching model, in which the teacher is the main transmitter of knowledge (Camargo; Daros, 2018).

Active methodologies are based on the idea that students should be active participants in the process of knowledge construction. Among the most common are problem-based learning (PBL), flipped classroom, project-based teaching, case studies, and gamification. These approaches seek to promote critical reflection, collaborative work, research, and problem-solving, favoring meaningful learning. By integrating these methodologies, students are no longer mere receivers of information and become co-authors of their own learning, which favors the retention of content and the development of essential skills for the job market of the future (Bacich; Moran, 2018).

On the other hand, emerging technologies play a crucial role in this process of educational transformation. The use of digital tools, such as online teaching platforms, educational applications, augmented reality resources, and artificial intelligence, has enhanced the reach and flexibility of teaching. The use of these technologies makes it possible to personalize learning, as it allows students to advance at their own pace and have access to teaching materials in an interactive and stimulating way. In addition, these technologies can provide more collaborative learning, through virtual learning environments, and encourage research and the use of diversified sources of knowledge (Inocente; Tommasini; Castaman, 2018).

The integration between active methodologies and technologies, therefore, is not limited to the use of digital resources, but involves a paradigm shift in the teaching-learning process. This approach proposes that the role of the teacher be rethought, moving from a transmitter of knowledge to a facilitator of learning, guiding students to explore the content in a more autonomous and critical way. The combination of these methodologies with digital technologies has the potential to transform the way schools and universities structure their curricula, in addition to allowing students to develop essential digital skills for the future (Peixoto, 2016).

However, despite the evident benefits, the implementation of active methodologies and the use of technologies in education still face significant challenges. Many educators, for example, find it difficult to adapt their pedagogical practices to these new approaches, either due to lack of training or resistance to changes in the teaching process. In addition, unequal access to technologies, especially in more remote regions or in contexts of social vulnerability, can create barriers to the effective integration of these resources. Therefore, it is essential to understand how these methodologies can be applied effectively in different educational contexts and what factors favor or hinder their implementation (Volpato; Dias, 2017).

In order to explore these issues, the objective of this research is to analyze how active methodologies can be integrated into the use of digital technologies in the educational context, investigating the benefits, challenges and implications of this integration. The study seeks to identify the main pedagogical strategies that involve these methodologies and technologies, as well as to analyze the perceptions of teachers and students about the impact of this approach on the teaching-learning process. In addition, it is intended to understand how the continuing education of educators can contribute to the adoption of these innovative practices.

To achieve these objectives, a bibliographic research was carried out that analyzed several studies and academic publications on the subject. The literature review involved the research of scientific articles, books, theses and dissertations that deal with the application of active methodologies and digital technologies in education. The bibliographic research allowed us to identify the main trends, challenges and results of this integration, as well as the successful experiences in different educational contexts.

DEVELOPMENT

TECHNOLOGICAL ADVANCEMENT IN EDUCATION

Technological advancement in education has been one of the most striking and transformative phenomena of recent decades, radically reshaping the way teaching and learning are conceived and experienced. Technology, initially seen as an auxiliary tool in classrooms, has now become a central pillar in the educational structure, offering a wide range of resources and possibilities to enrich the pedagogical experience. This digital revolution has not only changed access to knowledge, but also the way students interact with content, teachers and each other, creating new, more dynamic and interactive teaching models (Bacich; Moran, 2018).

Historically, education has always been related to the use of technologies, from the invention of writing to the introduction of the printing press, which enabled the dissemination of knowledge on a large scale. However, the pace and scale of technological advancement in modern times has been unprecedented. The use of computers, tablets, smartphones, social networks, educational applications, and online teaching platforms is increasingly common in educational institutions, from elementary school to higher education. These resources allow students to access a huge amount of information from anywhere and at any time, making learning more flexible and accessible (Camargo; Daros, 2018).

The internet and online learning platforms, for example, have created a new paradigm of education. Distance learning (DE) and the hybrid teaching model, which combines face-to-face classes with online activities, have become popular, especially after the COVID-19 pandemic, when the adoption of educational technologies intensified. This transition to virtual learning environments has allowed schools and universities to reach students in remote regions or those who face mobility difficulties, democratizing access to quality education (Bacich; Moran, 2018).

In addition, teaching platforms offer a variety of tools, such as discussion forums, video conferences, interactive quizzes, and multimedia resources, which enrich the educational experience. Another example of technological advancement in education is the use of augmented reality (AR) and virtual reality (VR) technologies, which have gained popularity in educational environments. AR and VR allow students to have immersive and interactive experiences, which facilitates the understanding of complex concepts and provides practical experiences that would be impossible in the traditional teaching context. For example, in science classes, students can explore the interior of the human body in 3D, visualize chemical reactions, or perform simulations of natural phenomena (Peixoto, 2016).

These technologies create a more engaging learning environment, which encourages curiosity and exploration, increasing information retention. In addition, artificial intelligence (AI) is becoming an important ally in the personalization of learning. AI-based software can adapt content according to the student's pace and needs, providing more individualized teaching. Platforms such as intelligent tutoring systems, for example, help students overcome specific difficulties by offering additional explanations or complementary exercises (Volpato; Dias, 2017).

AI is also being used to assess student performance in real-time, allowing educators to adjust their pedagogical approaches and provide immediate feedback. This personalization of learning is one of the great advantages of technology in education, as it recognizes the uniqueness of each student, allowing them to learn more efficiently and at

their own pace. Social networks and communication tools also play a growing role in education, not only as a means of social interaction, but as tools for collaborative learning (Inocente; Tommasini; Castaman, 2018).

Apps like Google Classroom, Slack, and Microsoft Teams give students and teachers platforms to share resources, work on collaborative projects, and communicate quickly and efficiently. These digital environments have proven to be fundamental for the development of skills such as collaboration, group problem-solving, and effective communication, essential skills for the contemporary world and the job market. However, technological advancement in education is not limited to the incorporation of new tools and resources. It has also challenged traditional pedagogical approaches, requiring a deep reflection on the role of technology in the educational process (Camargo; Daros, 2018).

The adoption of active learning methodologies, such as the flipped classroom, for example, is being facilitated by the use of technologies, allowing students to become more responsible for their learning, engaging in practical and collaborative activities before and after face-to-face classes. The combination of digital technologies with innovative pedagogical approaches is transforming the role of the teacher, who is no longer the only transmitter of knowledge to act as a facilitator of learning (Volpato; Dias, 2017).

However, technological advances in education also bring important challenges, such as the need for constant training of educators, unequal access to technologies, and informational overload. The effective implementation of educational technologies requires careful planning and adequate infrastructure, as well as continuous training for teachers, so that they can use the tools pedagogically and effectively. The lack of access to quality equipment and the internet in some regions is also a significant barrier, which can aggravate educational inequality, making digital inclusion and equal access to knowledge even more difficult (Bacich, 2015; Hattie, 2017).

ACTIVE METHODOLOGIES IN EDUCATION: APPROACHES AND CONCEPTS

Active methodologies in education represent a pedagogical approach that seeks to place the student at the center of the teaching-learning process, with the aim of promoting more meaningful, collaborative, and engaged learning. In contrast to the traditional teaching model, in which the teacher is the main transmitter of knowledge, active methodologies encourage students to become protagonists of their own learning, developing skills such as autonomy, critical thinking, problem-solving, and collaboration. These methodologies aim to create a more dynamic and interactive educational environment, where the student is

challenged to build, apply and reflect on knowledge in a more practical and contextualized way (Inocente; Tommasini; Castaman, 2018).

One of the main concepts of active methodologies is the idea that learning should not be a passive process, in which the student only receives information, but rather an active activity, in which he actively participates in the construction of knowledge. This implies a direct involvement of students with the contents, with colleagues and with the teacher, in a collaborative process of exchange of knowledge and experiences. By promoting the active participation of students, active methodologies have the potential to increase motivation and engagement, which are fundamental factors for effective learning (Peixoto, 2016).

There are several approaches within active methodologies, each with its own particularities and strategies, but all with the common goal of promoting a more student-centered education. Among the most used active methodologies, problem-based learning (PBL), project-based learning (PBL), flipped classroom, gamification, case study, and collaborative learning stand out. Each of these approaches has its own characteristics that make it suitable for different educational contexts, but they all share the idea that learning should be contextualized, interactive, and guided by real or meaningful issues for students (Volpato; Dias, 2017; Moll, 2011).

Problem-based teaching (PBL) is a methodology that uses real problem situations as a starting point for learning. In this approach, students are challenged to investigate and solve a specific problem, which leads them to apply the knowledge acquired in a practical way. The teacher acts as a facilitator, guiding the investigation process and providing resources, but does not provide the solution to the problem, stimulating students to think critically and creatively. This method is especially effective for the development of problem-solving and critical thinking skills (Bacich; Moran, 2018).

Project-Based Learning is an approach in which students work on long-term projects, usually in groups, to investigate an issue or develop a product. These projects require students to integrate various areas of knowledge, promoting interdisciplinary learning. The focus is on the practical application of what has been learned, and the process of creation or investigation results in a final deliverable that can be a presentation, a prototype, a research or another type of tangible product. This approach promotes collaboration, creativity, and autonomy, in addition to involving students in activities that have relevance and application in the real world (Camargo; Daros, 2018).

The flipped classroom is a strategy that reverses the traditional division between study time at home and at school. In the traditional model, students study content at home

and review it in class, whereas, in the flipped classroom, students are encouraged to study theoretical content outside of the classroom, usually through videos, readings, or other multimedia materials. The time in the classroom is then used for practical activities, discussions, debates, and problem solving, with the teacher acting as a mediator. This approach allows for a more productive use of time in the classroom, favoring the application of knowledge and the clarification of doubts in real time. Gamification is another popular approach to active methodologies that uses game elements and dynamics to make learning more engaging and motivating (Inocente; Tommasini; Castaman, 2018).

The idea is to incorporate aspects of games, such as scoring, challenges, rewards, and immediate feedback, into the learning process. This does not mean that content should be reduced to a simple game, but rather that students can be motivated by challenges and goals that encourage healthy competition, engagement, and continuous effort. Gamification can be particularly effective in making activities more interactive and dynamic, helping students feel more engaged and accountable for their learning.

The case study is a methodology that proposes a detailed analysis of real or hypothetical situations, with the aim of encouraging students to apply theoretical knowledge to the resolution of practical problems. This approach allows students to develop critical analysis, decision-making, and problem-solving skills, as well as learn to deal with complex situations that do not have simple or immediate solutions (Bacich; Moran, 2018).

The case study also stimulates reflection on the practical implications of knowledge, preparing students to face challenges in professional contexts. Finally, collaborative learning is an approach that emphasizes interaction between students as a tool for learning. In this methodology, students work in groups to share ideas, discuss concepts, solve problems, and build knowledge together. The teacher, as a facilitator, guides group work, promoting a learning environment in which students can learn from each other and develop communication, cooperation, and negotiation skills (Camargo; Daros, 2018).

Collaborative learning is particularly effective in developing socio-emotional skills and fostering more reflective and critical learning. These methodologies, when integrated with the use of technologies, gain even more potential. Digital tools, such as online teaching platforms, multimedia resources, educational applications and games, are powerful allies in the implementation of these methodologies, providing students with more interactive and accessible environments for learning. Technologies allow activities to be more dynamic, personalized and diversified, in addition to promoting greater collaboration among students, regardless of their physical location (Volpato; Dias, 2017).

OPPORTUNITIES FOR THE USE OF ACTIVE METHODOLOGIES AND TECHNOLOGIES IN EDUCATION

The use of active methodologies and technologies in education offers a range of opportunities that have the potential to radically transform the way teaching and learning take place. These opportunities are not only limited to improving academic results, but also promoting the development of essential skills for the 21st century, such as creativity, problem-solving, critical thinking, collaboration, and autonomy. When combined, active methodologies and technologies enable more dynamic, inclusive and meaningful learning, which prepares students for the challenges of an increasingly digital and interconnected world (Peixoto, 2016).

One of the main opportunities is the increase in student engagement. Active methodologies, such as problem-based learning (PBL) or the flipped classroom, place students as protagonists of the learning process, making them more responsible for their own knowledge. By leaving the position of passive receivers of information, students become more actively involved in learning activities, which increases their interest and motivation. When these approaches are combined with technological tools, such as videos, educational games, interactive quizzes, and simulators, engagement increases even more, as technologies provide a more immersive and interactive experience (Camargo; Daros, 2018).

In addition, the use of digital technologies facilitates the personalization of learning. With the help of digital platforms, applications, and artificial intelligence systems, it is possible to create learning paths adapted to the needs of each student, respecting their pace and learning style. Personalization allows students with different levels of knowledge, skills, and interests to advance independently, accessing materials and activities that meet their specific needs. This personalization is particularly important in contexts where the diversity of rhythms and skills is a striking characteristic of the class. AI-based learning tools, for example, can adjust the difficulty level of activities according to the student's performance, providing a more fluid and challenging experience (Innocent; Tommasini; Castaman, 2018).

Another significant opportunity is the promotion of collaborative learning. Active methodologies encourage group work, the exchange of ideas, and the collective construction of knowledge. Technological tools, such as online teaching platforms (Google Classroom, Microsoft Teams), discussion forums, video conferences, and wikis, are ideal for supporting collaboration among students, facilitating communication and resource sharing, even in remote or hybrid teaching contexts (Bacich; Moran, 2018).

The use of technologies in collaborative learning is not limited to interactions between students in the same classroom, but also allows collaboration between students from different locations, expanding the horizon of knowledge exchange. This is especially relevant to fostering the ability to work in diverse teams, a crucial skill in the globalized professional world. Active methodologies, when integrated with technologies, also open up new possibilities for practical and contextualized learning. By applying concepts in real situations, such as in approaches such as project-based learning (PBL) or problem-based teaching, students can develop practical skills, such as problem-solving, creativity, and critical thinking (Camargo; Daros, 2018).

The use of technological tools can enrich this experience by allowing students to perform simulations, access real-time data, perform case analysis, and explore different sources of information. For example, in science education, augmented reality (AR) and virtual reality (VR) can be used to create immersive experiences that allow students to explore the interiors of cells, planets, or even conduct virtual experiments. This not only makes learning more interesting, but also facilitates the understanding of content that would be difficult to learn only through traditional methods (Bacich; Moran, 2018).

A great advantage of using technologies in active methodologies is the expansion of feedback possibilities. The use of digital platforms and technological tools allows students to receive immediate feedback on their performance, whether in formative assessment activities, quizzes, or projects. This real-time feedback is essential for the student to understand their difficulties and to be able to adjust their learning trajectory before moving on (Peixoto, 2016).

In addition, teachers can also track student progress through digital monitoring tools, quickly identifying which students are struggling and offering individualized support. Continuous assessment and the possibility of quick adjustments contribute to a more effective learning process that is more aligned with the needs of each student (Camargo; Daros, 2018).

Accessibility and inclusion are other great opportunities provided by the combination of active methodologies and technologies. Digital tools allow education to be more inclusive by offering resources such as subtitles, machine translation, screen readers, and multimodal materials that cater to different learning needs, such as students with hearing, visual, or cognitive impairments. In addition, the use of distance learning platforms and digital resources makes learning more accessible to students in remote areas or with mobility difficulties, allowing more people to have access to quality education (Volpato; Dias, 2017).

Digital inclusion, therefore, is not limited to access to technologies, but also to the adaptation of content so that all students, regardless of their conditions or locations, can learn effectively. The use of active methodologies and technologies also facilitates students' preparation for the future, as these approaches favor the development of competencies and skills that are highly valued in the current job market (Inocente; Tommasini; Castaman, 2018).

The ability to solve complex problems, work in a team, communicate effectively, learn autonomously, and use digital tools are essential skills for insertion and success in the contemporary professional world. By applying methodologies that encourage hands-on learning and the use of technologies, students are better prepared to face the challenges of an increasingly dynamic and technological labor market (Inocente; Tommasini; Castaman, 2018).

Finally, active methodologies, combined with technologies, contribute to the improvement of educational management and teacher training. Technologies not only make it easier for students to learn, but they also help educators manage their lessons more effectively. For example, learning management systems (LMS) allow teachers to plan, monitor, and analyze activities in a more organized way, as well as enable constant communication with students and parents. The continuous training of educators is also favored, as there are several platforms and online courses that offer training in new methodologies and digital tools, helping teachers to keep up to date with educational trends (Camargo; Daros, 2018).

FINAL CONSIDERATIONS

Research on the use of active methodologies and technologies in education reveals the transformative potential that these approaches have to improve the teaching-learning process, adapting it to the needs and requirements of an increasingly digitized and interconnected society. By analyzing active methodologies, such as problem-based teaching (PBL), flipped classroom, project-based learning (PBL), and gamification, it was possible to realize that these strategies not only involve students in a more active and participatory way, but also stimulate the development of essential skills for the twenty-first century, such as critical thinking, collaboration, autonomy and problem solving.

The use of digital technologies, when integrated with active methodologies, offers a number of benefits, such as personalizing learning, increasing student engagement, and facilitating collaborative learning. Technological tools, such as online teaching platforms, augmented reality (AR), artificial intelligence (AI), and educational applications, expand

pedagogical possibilities, making the learning process more dynamic, accessible, and relevant. Personalization, for example, allows students to learn at their own pace, while technological resources make content more interactive, engaging, and contextualized, allowing teaching to adapt to the diversity of learning styles and needs present in a classroom.

In addition, active methodologies and technologies not only favor student learning, but also offer opportunities for improving teacher training and educational management. Teachers, by adopting these approaches, can develop more effective mediation skills, stimulating more autonomous and collaborative learning. Digital tools allow for more efficient management of the educational process, monitoring student progress and providing continuous feedback, which contributes to a more accurate and timely formative assessment.

The continuous training of educators also benefits from this integration, as the offer of online courses and training platforms allows teachers to stay up to date with new methodologies and technological tools. However, the successful implementation of these methodologies and technologies is not without its challenges. The lack of adequate infrastructure, unequal access to technologies, and the need for continuous training for educators are barriers that need to be overcome to ensure a more equitable and inclusive education.

Although technological tools are a valuable ally in the educational process, they are not a magic solution by themselves. The success of this integration depends on well-structured pedagogical planning, public policies that guarantee access to all students, and a cultural change in the way teachers and students see the teaching-learning process. Finally, the survey highlights the relevance of active methodologies and technologies in the formation of a more autonomous, creative and prepared student for the challenges of the future.

Education, at its core, is a continuous process of adaptation and innovation, and the integration of these approaches represents a significant step forward in this process. The proper use of active methodologies and technologies can promote more effective, inclusive, and meaningful learning, expanding the possibilities for education in the twenty-first century. In this sense, the conclusions of this research not only point to the benefits of these approaches, but also to the need for educational policies that encourage their implementation on a large scale, ensuring that all students can benefit from the opportunities that these new pedagogical practices offer.

REFERENCES

1. BACICH, L. Ensino híbrido: personalização e tecnologia na educação. Porto Alegre: Bookman, 2015.

2. BACICH, L.; MORAN, J. Metodologias ativas para uma educação inovadora: uma abordagem teórico-prática. Porto Alegre: Penso, 2018.

3. CAMARGO, F.; DAROS, T. A sala de aula inovadora: estratégias pedagógicas para fomentar o aprendizado ativo. Porto Alegre: Penso, 2018.

4. INOCENTE, L.; TOMMASINI, A.; CASTAMAN, A. S. Metodologias ativas na educação profissional e tecnológica. Redin, 2018.

5. HATTIE, J. Aprendizagem visível para professores: como maximizar o impacto da aprendizagem. Porto Alegre: Penso, 2017.

6. MOLL, J. Educação profissional e tecnológica no Brasil contemporâneo: desafios, tensões e possibilidades. Porto Alegre: ArtMed, 2011.

7. PEIXOTO, A. G. O uso de metodologias ativas como ferramenta de potencialização da aprendizagem de diagramas de caso de uso. Periódico Científico Outras Palavras, volume 12, número 2, ano 2016.

8. VOLPATO, A. N; DIAS, S. R. Práticas inovadoras em metodologias ativas Florianópolis: Contexto Digital, 2017.