



## Enhancing educational practices through technology and instructional design

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Altamar José dos Santos<sup>1</sup>, Sônia Soares Santos<sup>2</sup>, João Soares Santos<sup>3</sup>.

### ABSTRACT

This article explores instructional design and its role in the development of teaching and learning, with an emphasis on the integration of technology. The central focus is on how instructional design can create effective learning environments. The methodology includes a literature review on the use of digital tools, e-learning platforms and multimedia resources, which facilitate the creation and personalization of educational content. Authoring software and learning management applications allow the creation of interactive materials and the adaptation of teaching to the individual needs of students. However, the integration of technology into instructional design faces challenges, such as inequality of access, the need to create inclusive resources, and the continuous updating of content. Teacher training is critical to the effective use of new technologies, and overcoming resistance to change is an important aspect. The conclusion highlights that in order to maximize educational impact, it is essential to address these challenges and adhere to rigorous ethical considerations. An ongoing commitment to teacher education, the development of inclusive technologies, and the protection of student privacy are key to transforming education, making it more accessible, engaging, and effective.

**Keywords:** Instructional Design, Technology, Educational Practices, Teaching, Learning.

### INTRODUCTION

Instructional design emerged during World War II, but has been gaining strength today, playing a fundamental role in the chain of teaching and learning, acting as a bridge that unites theory and practice to create effective educational experiences. Smith and Ragan apud Dubugras define instructional design as

(...) a systematic process of translation of learning principles in the planning of educational activities, including the definition of evaluation processes, considering the context of the course. The goal of instructional design theory is to suggest the best methods for facilitating learning and skill development. (2022:58-59)

This interdisciplinary field relies on systematic and scientific models, such as the ADDIE model, to guide the creation and implementation of structured learning environments, where

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<sup>1</sup> Master's student in Emerging Technologies in Education at Must University  
Email: altemarsantos17662@student.mustedu.com

<sup>2</sup> Master's student in Emerging Technologies in Education at Must University  
E-mail: soniasantos17614@student.mustedu.com

<sup>3</sup> Doctor in Educational Sciences from the Universidad Nacional de Rosario - ARG  
Email: joao.soares.2@hotmail.com



analysis identifies learning demands and objectives, design transforms these objectives into detailed plans, development produces instructional materials, implementation introduces these materials, and evaluation ensures effectiveness and allows for continuous adjustments.

With the increasing integration of digital technologies, instructional design has evolved to include a wide range of tools that enrich the teaching/learning process. Software and new technologies have been an important tool to provide new ways to stimulate students and individualize educational practice, which makes learning not only more dynamic and accessible, but also allows for personalization that meets the individual needs of students, promoting more effective and inclusive teaching.

However, the integration of technology in instructional design also presents challenges, such as the requirement to ensure accessibility and inclusion, maintaining the quality and continuous updating of the content, and preparing teachers to use these new tools effectively, which show us the relevance of having more studies in the area.

## **INSTRUCTIONAL DESIGN (DI) AND THE IMPORTANT ROLE IN THE TEACHING AND LEARNING PROCESS**

Instructional design as an interdisciplinary field that combines theory and practice to develop effective learning experiences, having in the ADDIE model one of its best-known models, for being able to guide instructional designers in an iterative and structured method. According to (Branch, 2009), this has as one of its foundations a systematic and scientific approach to the formation of study environments, and consists of the phases of Analysis, Design, Development, Implementation and Evaluation.

In the ADDIE model, the first element is Analysis, which refers to the identification of needs and definition of educational objectives based on a detailed understanding of students and learning contexts (Smith & Ragan, 2005). At this stage, it is crucial to conduct an in-depth analysis of the students' characteristics, including their prior knowledge, learning styles, motivations, and challenges.

After analysis, it follows Design, which transforms the learning objectives into a detailed plan, including the selection of instructional strategies and assessment methods (Dick, Carey, & Carey, 2005). This phase involves undertaking a detailed course roadmap, which specifies the learning objectives, instructional activities, required resources and means of assessment, and where learning theories are applied to ensure that instructional materials are optimised (Mayer, 2009).



With the creation of the script comes the development phase, which consists of the creation and production of instructional materials, such as texts, videos and reading modules.

During development, instructional materials are grounded in the design plan, which may include the construction of visual and auditory aids, development of interactive e-learning modules, preparation of study guides, and preparation of practical activities. In this context, the integration of instructional design principles, such as segmentation and the use of multimedia, is fundamental in this phase (Gagné et al., 2005).

Once the creation and development stages are completed, the implementation follows, which begins the students' contact with the materials with the distribution of instructional materials and the conduction of teaching practices. However, it is essential in the way of implementation to ensure that instructors are well prepared to handle resources and that students have adequate access to technological tools, and for this it is essential to have permanent support and the resolution of technical problems (Reigeluth, 1999).

Throughout the process of creating the instructional design, the evaluation should be continuous, as conducted during the course can, by providing feedback, allow for quick adjustments to achieve the initial objectives and goals.

Finally, at the end of the course, summative assessments are carried out, qualified means to measure the overall effectiveness of the program and the impact on students, ensuring that the learning objectives are achieved and that the program is continuously improving (Kirkpatrick & Kirkpatrick, 2006).

## THE ROLE OF TECHNOLOGY AND ITS TOOLS IN INSTRUCTIONAL DESIGN

Digital tools have revolutionized instructional design by providing a wide range of resources that facilitate the creation and implementation of educational materials, enriching the development of teaching and learning in various ways. These tools include authoring software, reading platforms, and learning management applications (LMS).

Many software allow the construction of interactive reading modules, with quizzes, videos, simulations and other resources that streamline learning, because as stated by Reiser and Dempsey (2017), "digital tools allow instructional designers to create interactive and multimodal content, which meets different learning styles and promotes student engagement". These software facilitate the integration of multimedia, which, according to Mayer (2009), "enriches learning by combining visual and auditory elements that help reinforce understanding and knowledge retention".



Learning management apps or online learning platforms offer virtual environments for students to access educational content, interact with peers, instructors, and participate in educational assignments. In addition, according to Bates (2017), these applications allow a greater adaptation to the student's reality, which may involve subjective learning factors, but also with regard to the configuration of their daily life, such as working on cultural issues.

In view of this, these platforms make it possible to facilitate the development of learning, and there is also a personalization of learning, by allowing instructors to adapt content and activities to the individual needs of learners, in addition to the chance to monitor their progress, providing personalized feedback and adjusting the pace and difficulty of the content as needed.

In addition, the various multimedia resources, such as videos, audios, animations and infographics, can make the content more attractive and help illustrate complex concepts in a clear and concise way, since the use of multimedia is effective in promoting deep learning by allowing students to process information through multiple sensory channels (Moreno & Mayer, 2007).

New technologies such as virtual reality and artificial intelligence are expanding the possibilities in instructional design by offering new ways to stimulate learners and personalize the learning experience by providing immersive experiences and real-time feedback (Johnson et al., 2016).

According to Dalgarno and Lee (2010):

"Immersive technologies, such as virtual reality and augmented reality, have the potential to create learning experiences that are not only memorable but also more effective in promoting deep understanding and knowledge retention" (2010).

AI can make it possible to personalize learning, according to the individual demands of students, offering content recommendations, automated feedback, and adaptive support. Johnson et al. (2016) highlight that "artificial intelligence has the potential to transform education by providing personalized support and data-driven interventions that help meet the specific needs of each student."

In addition to these tools, we also have adaptive learning systems, which automatically adjust the content and pace of teaching based on students' performance and responses, allowing each student to progress at their own pace and receive additional support when needed. According to Kulik & Fletcher (2016), adaptive learning can significantly improve educational outcomes, especially for students with learning disabilities.



## TECHNOLOGY ENHANCING THE EFFECTIVENESS OF EDUCATIONAL PRACTICES

The intersection between technology and instructional design enhances the effectiveness of educational practices in various ways, as a well-planned and technologically integrated instructional design increases student engagement, promoting active and participatory learning (Merrill, 2002).

Technology allows the personalization of the learning experience, adapting methods and materials to meet the individual needs of students (Smith & Ragan, 2005), which by incorporating game elements, such as scores, medals and challenges, can increase student motivation and make the acquisition of knowledge more fun and engaging.

Another positive factor is the facilitated access, as Bates (2017) highlights that online learning platforms allow greater flexibility in teaching, as students can access materials anytime and anywhere, being particularly beneficial for those with irregular schedules or other responsibilities.

Technology facilitates continuous and formative assessment, allowing adjustments and advances in teaching and learning (Dick, Carey & Carey, 2005) and the study of educational data makes it possible to identify students' abilities in an individualized way, providing insights that enable them to be used to personalize teaching and improve pedagogical strategies (Kulkarni et al. 2016 apud Guimarães Júnior et al. 2023).

## CHALLENGES OF INTEGRATING INSTRUCTIONAL DESIGN WITH TECHNOLOGY

The integration of Instructional Design with technological tools represents a powerful combination that enhances the effectiveness of educational practices.

Digital tools, online learning platforms, multimedia resources, and emerging technologies collaborate to create more interactive, personalized, effective educational experiences, and offer numerous opportunities to improve the teaching and learning process. In addition, they also bring significant challenges and ethical considerations that need to be carefully evaluated.

One of the basic challenges refers to the accessibility and inclusion of special and/or low-income students, in the face of digital inequality, since it can accentuate educational inequality. As is well known, not all students have equal access to the technology necessary to fully participate in technology-based exercises. (Selwyn, 2011).

We cannot fail to remember that in addition to the lack of access to technology, according to Burgstahler (2015), teachers also face adversity to create resources that are accessible to all students, including those with disabilities, in order to make design truly accessible to all.



This is a very complicated obstacle, because "(...) The process of school inclusion implies radical changes in the understanding of the subjects and in the structure of the school, even questioning the subtle mechanisms of exclusion to which students seem predestined on a daily basis." (Gomes and Souza, 2011, p. 189)

Another relevant point refers to the quality of the content, with relevance to online training courses, as the content often becomes quickly obsolete, since technology and knowledge are in perennial evolution, and platforms do not always keep up with these updates. Therefore, it is important to ensure that educational content remains up-to-date, making this an ongoing task (Siemens, 2005).

In addition to the challenges brought, the updating and training of teachers is a challenge present at all levels and modalities of education in Brazil. In this context, teachers may need significant training to use new technologies effectively (Ertmer & Ottenbreit-Leftwich, 2010) and, furthermore, some educators may resist the adoption of these innovations due to familiarity with traditional methods (Cuban, 2001).

## **FINAL CONSIDERATIONS**

As technology evolves, instructional design must continue to adapt and incorporate these innovations to maximize educational impact, as their integration can transform education, making it more accessible, engaging, and effective. However, to reap these benefits, it is essential to address the challenges and adhere to rigorous ethical considerations, which involves an ongoing commitment to teacher training, designing inclusive technologies, protecting student privacy, and ensuring that all technology decisions are guided by sound ethical principles.

In light of this, it is necessary to implement strategies in accordance with each reality to ensure that all students have equal access to educational technologies, so that resources and additional support are offered to those who may be at a disadvantage. Thus, technology must empower students by offering them control over their own pace of learning, continuously monitoring the effect of technologies to ensure that they are actually improving learning and not causing inadvertent harm.



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