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Technology-Mediated Education: impact of AI on the main distance learning modalities

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Research Article

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Abstract

Background/purpose. Artificial Intelligence (AI) and distance learning (EaD) have profoundly transformed education, redefining teaching methodologies and learning dynamics. When integrated into educational environments, these technologies facilitate equitable access to knowledge, enable personalized learning, and enhance pedagogical flexibility. E-learning, blended learning (b-learning), and mobile learning (m-learning) exemplify technology-mediated instructional modalities that empower learners and educators to engage in innovative knowledge construction, transcending geographical barriers. This study critically examines the impact of AI-driven digital platforms on distance learning and their implications for pedagogical efficacy.

Materials/methods. A quantitative research design was employed to evaluate the benefits and challenges associated with AI-integrated digital platforms in distance education. Data were collected through an online survey administered to education professionals from three Portuguese-speaking regions with significant engagement in digital learning: Portugal (Europe), Brazil (Latin America), and Angola (Africa). The survey assessed perceptions regarding the extent to which AI-enhanced platforms influence pedagogical practices and learning outcomes.

Results. Analysis of 230 validated responses revealed substantial insights into the role of AI-driven platforms in education. Findings indicate that these technologies foster accessibility, support individualized learning pathways, and enhance instructional adaptability. Additionally, the study identifies key areas for improvement in the integration of AI-driven platforms within pedagogical frameworks to optimize educational efficacy.

Conclusion. The findings highlight the transformative potential of AI and digital platforms in distance education, emphasizing their capacity to enhance learning experiences and promote knowledge democratization. Nevertheless, the study underscores the necessity for ongoing optimization of these technologies to fully harness their pedagogical benefits and address existing limitations.

1. Introduction

Digitalization has profoundly transformed the field of education, bringing new ways of accessing knowledge and changing the dynamics of teaching and learning. Here, digital platforms play a central role in this process, offering varied resources that support different learning modalities, namely: e-learning (fully online teaching), b-learning (hybrid teaching, which combines face-to-face and online activities) and m-learning (mobile learning, which uses mobile devices). These tools facilitate access to educational content, as well as promoting interaction and collaboration between students and educators, adapting to users' individual needs.

Digital platforms are redefining education by offering a variety of options that meet the needs of different student profiles (Selwyn, 2016; Kirkwood & Price, 2016; Bates, 2019), these tools provide flexibility, accessibility and a personalized learning experience (Passey & Higgins, 2011). However, it is crucial that educators and students develop digital skills and use these platforms critically and effectively, ensuring that the potential of these technologies is fully explored (Ferrari, 2013; Janssen et al., 2013; Redecker & Punie, 2017; Heitink et al., 2017; Law et al., 2018; Falloon, 2020; Howard et al., 2021).

In the field of education, digital platforms, from both a knowledge and user perspective, have a profound and transformative impact. They democratize access to knowledge, allow for more personalized learning and offer new pedagogical possibilities (Anderson & Dron, 2011; Kirkwood & Price, 2014; Bond, et al., 2018). However, its success depends on a careful balance between the use of technology and human interactions (Salomon & Perkins, 1996; Cuban, 2001; Garrison & Anderson, 2003; Laurillard, 2012; Selwyn, 2016), as well as universal access to these resources. Ultimately, when well-integrated, digital platforms can revolutionize teaching and learning, preparing students for the challenges of the contemporary world (Fullan & Langworthy, 2014; Veletsianos & Moe, 2017; Horizon Report, 2018; Behrens, 2024).

Despite the advantages, digital platforms also present challenges. The digital divide is still a significant barrier for many students, especially in regions with poor infrastructure (Baturay, 2015; Silva et al., 2018; Horizon Report, 2020). Furthermore, excessive use of technology in education can reduce human interactions, which are essential for the development of social and emotional skills (Prensky, 2010). However, it is crucial to ensure universal access to these technologies and balance their use with pedagogical practices that value human interaction (Laurillard, 2012).

In recent decades, curricular reconfiguration has prioritized the development of transversal skills, such as problem-solving, reading comprehension, and collaboration, as argued by Priestley and Biesta (2013). However, Young (2007), Wheelahan (2010), Rata (2012), and Surma et al. (2025) critically and rigorously warn that this epistemological orientation tends to subordinate disciplinary knowledge, treating it as a secondary element or something that can be implicitly acquired solely through the practice of these skills. In this context, Morgado et al. (2024) highlight the need for an inclusive and dialogical perspective in teacher training, emphasizing that a balanced approach is essential to ensure both the acquisition of fundamental disciplinary knowledge and the development of transversal competencies.

2. Literature Review

Empirical studies indicate that this trend has led to a progressive erosion of the specificity of curricular content and a blurring of the value given to structured knowledge (Priestley & Sinnema, 2014). The continued deterioration in literacy, science and mathematics performance in several OECD countries (OECD, 2023) is a strong indication of the pressing need to refocus knowledge as a fundamental foundation for the development of higher cognitive skills. In recent years, the OECD has been reformulating its conceptual framework, beginning to recognize disciplinary knowledge as a

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structuring axis for promoting educational equity (OECD, 2019, 2021), in a clear shift from previous reports that predominantly emphasized the development of generic skills (Hughson & Wood, 2022). This reorientation suggests a growing recognition of the importance of systematized knowledge in building more rigorous, more equitable and intellectually enriching curricula (Crato, 2021).

Advances in artificial intelligence (AI) amplify the implications of curricular change, requiring critical reflection on the relationship between generic competencies and disciplinary knowledge (Surma et al., 2025; Barrett, 2024; Rata, 2024a). AI, particularly through tools such as language models and automation systems, has shown an impressive ability to perform generic skill-based tasks such as problem-solving or data analysis (Priestley & Biesta, 2013). However, for these tools to be used effectively and ethically, it is essential that users have in-depth and specific knowledge of the areas in which they apply these technologies (Young, 2007; Wheelahan, 2010). The devaluation of disciplinary knowledge in the curriculum can lead to an over-reliance on AI as a substitute for human knowledge, generating professionals with superficial skills who do not fully understand the limits, risks and ethical implications of these technologies (Priestley & Sinnema, 2014). On the other hand, a curriculum rich in specific knowledge allows students to develop a solid foundation for questioning, interpreting and contextualizing the responses generated by AI, promoting more responsible and informed use (Hirsch, 2016).

Furthermore, AI accentuates inequality in access to knowledge. Advanced tools tend to benefit those who already have a solid foundation of knowledge and technological literacy, widening educational disparities. Furthermore, building an equitable curriculum (Hirsch, 2016) with broad and deep content is essential to ensure that all students, regardless of socioeconomic background, can enjoy the benefits of AI equally (Barrett, 2024; Rata, 2024a; Surma et al., 2025). So, while AI promises to transform education and work, it also highlights the importance of a balance between generic skills and disciplinary knowledge. A well-structured curriculum based on in-depth content not only empowers individuals to critically interact with emerging technologies but also contributes to a more inclusive and informed society (Wheelahan, 2010; Hirsch, 2016) in an increasingly AI-mediated world.

3. Method

Quantitative, non-experimental, ex-post facto study. Data collection was carried out through a questionnaire survey, with closed answers, completely anonymous, and made available online for thirty days. Three hundred and twenty higher education teachers from the continents with the greatest expression and proficiency in the Portuguese language (CPLP) participated in the study: Portugal (Europe), Brazil (Latin America) and Angola (Africa). As a central objective of the research, we propose to identify the impact of AI on the main digital platforms/distance learning models that support e-learning, b-learning and m-learning modalities, highlighting their functionalities, advantages and limitations in the context of education and evaluation thereof. The population of the study involves teachers at HEIs in each of the countries chosen by continent, and participation was limited to respondents who exceeded 300 teachers and researchers, divided by each of the countries, in the terms and numbers mentioned in No. 4 'Results, Analysis and Discussion'. From the point of view of developing the data collection instrument, the process focused on current inter-institutional partnerships and protocols and was preceded by a pre-test.

4. Results, Analysis and Discussion

The study involved 230 individuals from Portugal, Brazil, and Angola. The largest representation was from Brazil, with 112 responses (48.7%), followed by Portugal, with 76 responses (33%), and Angola, with 42 responses (18.3%).

Regarding the area of teaching activity, the largest representation belongs to Social and Human Sciences (38.7%, n = 89), followed by Exact Sciences and Engineering (26.1%, n = 60). Life and

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Environmental Sciences (17.8%, n = 41) and Natural and Environmental Sciences (17.4%, n = 40) have similar proportions, with less expression in the sample. Regarding teaching experience, the majority of interviewees had up to 20 years of teaching experience (29.4%, n = 68). Next come teachers with more than 30 years of experience (20.4%, n = 47). Groups with up to 10 years (19.1%, n = 44) and up to 30 years of teaching (n = 43; 18.7%) have similar proportions. Finally, teachers with up to 5 years of experience represent the smallest portion of the sample (12.2%, n = 28).

Q1: Distance learning models are most used in your teaching practice.

When evaluating which distance learning models are most used in teaching practice (Table 1), it was found that e-learning is the distance learning model most used in teaching practice, being cited by 65.7% (n = 151) of respondents. This result reflects the consolidation of e-learning as a dominant approach, possibly due to its flexibility, accessibility and the maturity of the digital platforms that support it. Its predominance may also be associated with the experience acquired during the COVID-19 pandemic, which accelerated the adoption of virtual learning environments. With 25.2% (n = 58), M-learning stands out as a relevant alternative, suggesting a growing appreciation of mobile learning driven by the omnipresence of devices such as smartphones and tablets. This model promotes learning in diverse contexts, favoring student autonomy and continuous access to educational resources. B-learning (blended learning), with only 9.1% (n = 21), presents a more limited adoption, which can be interpreted in two ways: on the one hand, it may indicate challenges in implementing hybrid models that effectively integrate face-to-face and online learning; on the other hand, it may reflect a preference for clearly defined modalities, rather than mixed approaches that require greater complexity in pedagogical management.

Table 1. Distance learning models most used in teaching practice

Distance learning models	*n*	*%*
e-learning	151	65,7
b-learning	21	9,1
m-learning	58	25,2

Q2: In general, what is the main benefit or advantage of using these modalities?

The data obtained allow us to understand the main benefits attributed to distance learning, namely in its e-learning, b-learning and m-learning modalities (Table 2). The majority of respondents (53.9%, n=124) highlighted autonomous learning as the main benefit, which reflects a perception aligned with the pedagogical principles of these modalities. Distance learning, by its nature, promotes an active role for students in their own learning process, allowing them to manage the pace, content and methods most suited to their individual needs (Moore & Kearsley, 2011). Next, with 22.6% (n=52), come the benefits related to the development of technological skills and a collaborative environment. This data suggests that respondents recognize the impact of digital education on training for the use of technological tools, skills that are increasingly valued in the job market (Garrison & Anderson, 2003). Furthermore, distance learning can foster collaboration through forums, wikis and other interactive platforms, which contradicts the idea of isolation often associated with these modalities.

However, benefits traditionally highlighted in the literature, such as the democratization of access to knowledge (8.3%, n=19), flexible working hours, and reduced costs (7.4%, n=17), had a significantly lower representation. This discrepancy may indicate that respondents, possibly already inserted in a distance learning context, perceive these advantages as natural assumptions and not necessarily as the most impactful aspects. However, it is important to recognize that the accessibility

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provided by distance learning plays a crucial role in the inclusion of students who, for geographical, economic or social reasons, would have difficulty accessing traditional education (Anderson, 2008).

The low percentage (6.1%, n=14) that highlighted the development of technological skills and a collaborative environment may suggest that, despite the recognized importance of digital, the perception of collaboration in these modalities still faces challenges. Studies indicate that the success of online interactions depends on a structured pedagogical design, encouraging active student participation to avoid passive or solitary learning experiences (Salmon, 2013).

Table 2. Main benefit/advantage of using these modalities

Main benefit/advantage	*n*	%
Democratization of access to knowledge	19	8,3
Flexible hours and reduced costs	17	7,4
Personalized learning pace and variety of courses and programs	52	22,6
Development of Technological Skills and Collaborative Environment	14	6,1
Autonomous learning	124	53,9
Others	4	1,7

Q3: *In general, what is the main disadvantage of using these modalities?*

When asked about the main disadvantage of distance learning methods (Table 3), we see that dependence on technology and access issues are perceived as the biggest obstacle to distance learning (43.9%, n=101). This data reflects inequalities in access to digital resources, such as stable connectivity and adequate equipment, a problem particularly relevant in disadvantaged socioeconomic contexts (Anderson & Dron, 2011). The lower effectiveness in areas that require laboratory practice or in-person activities (28.3%, n=65) demonstrates an inherent limitation of distance learning, especially in natural sciences, health and engineering disciplines, where practical experimentation is essential (Means et al., 2013). The lack of face-to-face interaction (17.8%, n=41) emerges as a significant concern, indicating that, despite advances in synchronous and asynchronous tools, distance learning still does not fully replace the dynamics of face-to-face interactions, which are fundamental for the development of social and collaborative skills (Garrison, Anderson & Archer, 2000). The least mentioned disadvantages include excessive dependence on technology (6.1%, n=14), possibly related to prolonged screen time and the need for constant adaptation to digital platforms, and distraction in the online environment (3.9%, n=9), a recognized challenge but one that can be mitigated by interactive pedagogical strategies and active methodologies (Salmon, 2013).

Table 3. Main disadvantage of using these modalities

Main disadvantage	*n*	%
Lack of face-to-face interaction	41	17,8
Technology Dependency (Access Issues)	101	43,9
Technology dependence (overuse)	14	6,1
Lower effectiveness in some areas that depend on laboratory or other practice	65	28,3
Distractions in the online environment	9	3,9

Q4: *How regularly do you use digital platforms and distance learning models in the context of teaching and learning (as a teacher)?*

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The analysis of the regularity with which teachers use digital platforms and Distance Learning (EaD) models (Table 4) in the context of teaching and learning reveals significant trends in the use of these tools. According to the data presented, the majority of respondents use these platforms occasionally (57.8%, n = 133), which suggests moderate and selective adoption, possibly influenced by contextual factors, such as the discipline taught, familiarity with digital technologies and the perception of the pedagogical effectiveness of distance learning. The second most representative category corresponds to teachers who claim to rarely use these tools (26.1%, n = 60), which may indicate barriers related to a lack of digital skills, resistance to change or limitations in technological infrastructure. On the other hand, the percentage of teachers who use it frequently (12.6%, n = 29) or always (2.2%, n = 5) highlights a group more involved with digital pedagogical practices, potentially motivated by previous positive experiences, greater technological competence or teaching contexts that favor the continuous use of distance education. The low incidence of "never" responses (1.3%, n = 3) reflects a scenario in which contact with digital platforms is practically inevitable, which can be attributed to the increasing digitalization of education, especially after the impact of the COVID-19 pandemic, which accelerated the adoption of digital technologies in educational contexts.

Table 4. Regularity using digital platforms and distance learning models

Never	Rarely	Occasionally	Frequently	Always
1,3%	26,1%	57,8%	12,6%	2,2%
(*n= 3*)	(*n= 60*)	(*n=133*)	(*n= 29*)	(*n=5*)

Q5: *When accessing knowledge (including research to prepare teaching activities), indicate how regularly you use AI.*

From the data analysis (Table 5), there is a growing trend towards using Artificial Intelligence (AI) in accessing knowledge and preparing teaching activities. The majority of respondents stated that they frequently (40%, n = 92) or occasionally (35.7%, n = 82) use these technologies, which suggests a progressive integration of AI into pedagogical and research practices. This distribution indicates that, although the use of AI is not yet a universal and systematic practice, it is becoming a relevant tool in supporting teaching work.

The last representative responses, namely always (8.3%, n = 19) and never (1.3%, n = 3), reveal two extremes of behaviour. Constant use by a minority may reflect profiles of greater digital literacy, interest in pedagogical innovation, or academic contexts more dependent on AI-based technologies. In contrast, non-existent or rare use (14.8%, n = 34) may be associated with factors such as resistance to adopting new technologies, lack of specific training, or critical perceptions regarding the reliability and usefulness of AI in education. These results highlight the need for critical reflection on the role of AI in higher education, considering both its potential to optimize research and teaching processes and the ethical, pedagogical and technical challenges that its use may imply. Furthermore, they highlight the importance of continuing education policies for teachers, which promote the informed and critical use of these tools.

Table 5. Regularity using digital platforms and distance learning models

Never	Rarely	Occasionally	Frequently	Always
1,3%	14,8%	35,7%	40%	8,3%
(*n= 3*)	(*n= 34*)	(*n=82*)	(*n= 92*)	(*n=19*)

Q6: *What is the level of use of AI in your work as a higher education teacher?*

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These results indicate broad adherence to AI, although predominantly in accessible and individual modalities, suggesting that institutional integration is still limited (Table 6). Significant use of free versions may reflect budget constraints or an early phase of teacher experimentation. On the other hand, the subscription to premium versions demonstrates that a considerable portion of users recognize the value of AI for pedagogical and research purposes, investing in more advanced tools.

The low use of institutional solutions may indicate a lack of strategic initiatives by universities to implement AI structuredly. This factor reinforces the need for institutional policies that promote equitable access to advanced technologies, ensure adequate training, and explore AI's potential in pedagogical innovation.

Table 6. Level of use of AI in higher education teaching Activities

Level of use of AI in teaching activities	*n*	*%*
Basic Usage - Free Version	76	33
Intermediate Use - Initial Paid Version (Standard/Basic Plan)	57	24,8
Advanced Usage - Premium Version (Pro or Enterprise)	61	26,5
Institutional or Personalized Use	34	14,8
Experimental or Developmental Use	2	0,9

Q7: *Indicate, in order of importance, based on your teaching experience, what is the main advantage in using and articulating digital platforms and AI in teaching and learning.*

The data suggests (Table 7) that teachers place significant value on developing digital skills and future readiness (68.7%, n = 158) as the main benefit of using digital platforms and AI in teaching and learning. This result reflects the growing importance attributed to the mastery of digital technologies in the educational context in view of the demands of an increasingly technological and globalized job market. The development of digital skills, which ranges from technological literacy to the development of critical skills for which adapt to innovations, is seen as essential to prepare students for the challenges of the future (Redecker, 2017).

In the background, the efficiency and automation of administrative tasks (14.3%, n = 33) stands out, which points to teachers' improvement in the management of time and resources, allowing them to focus more on pedagogical activities. This use of AI to automate tasks such as assessment, feedback or administrative data management can significantly reduce workload and increase productivity, contributing to more efficient management of the educational process (Brynjolfsson & McAfee, 2014). Personalization of learning (6.1%, n = 14), which, although a recognized advantage, does not yet appear to be fully explored in the context of respondents. Personalization, promoted by digital platforms and AI, allows teaching more adapted to the individual needs of students, enhancing their engagement and performance (Siemens, 2013). However, its effective implementation may depend on the available technological infrastructure and the preparation of teachers to use it optimally. Accessibility and flexibility (5.7%, n = 13) emerge as an important advantage, but with less prominence, which may reflect a perception that these characteristics are more limited compared to the advantages mentioned above. Finally, data analysis and continuous improvement (5.2%, n = 12) appears as an advantage with reduced relevance, suggesting that, although data analysis tools can assist in the monitoring and feedback process, teachers may not be fully exploring the potential of these technologies for the continuous improvement of pedagogical practice.

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Table 7. Main advantage in the use/articulation between digital and AI platforms in teaching and learning

Main advantage in the use/articulation between digital and AI platforms	*n*	%
Personalizing Learning	14	6,1
Accessibility and Flexibility	13	5,7
Efficiency and Automation of Administrative Tasks	33	14,3
Digital Skills Development and Future Readiness	158	68,7
Data Analysis and Continuous Improvement	12	5,2

Q8: *What impact does the use of digital platforms, distance models and AI have on the educational academic life that you observe, interact with and participate in directly?*

When we intend to verify the Impact that the use of digital platforms, distance models and AI have on educational academic life (Table 8), we see that the development of digital skills and preparation for the future are seen as the main consequences of the use of digital platforms, distance models and AI in academic life (72.2%, n = 166). This result reflects the growing importance of digital training, which not only prepares students for the challenges of the job market, but also prepares them for a world increasingly dependent on advanced technologies (Redecker, 2017). In second place, the transformation of access to education (12.6%, n = 29) shows that digital technologies and AI have the potential to democratize education, expanding its reach and making knowledge more accessible to a diverse audience. This impact is particularly relevant in contexts where geographical or socioeconomic barriers hinder access to quality educational institutions (Anderson & Dron, 2011). Autonomy and personalized learning (7.8%, n = 18) emerges as an important consequence, highlighting the ability of digital platforms and AI to adapt to students' individual needs, promoting more flexible teaching adjusted to each student's pace and learning style (Siemens, 2013). The change in teaching and assessment methods (7.4%, n = 17) is recognized, but with less prominence, indicating that, although technology has a growing impact on pedagogical and assessment approaches, these changes are still in the process of implementation and maturation.

Table 8. The impact that the use of digital platforms, distance models, and AI have on academic educational life

Impact	*n*	*%*
Transforming access to education	29	12,6
Autonomy and personalized learning	18	7,8
Change in teaching and assessment methods	17	7,4
Developing digital skills and preparing for the future	166	72,2

Q9: *How often is AI used to interact with students and in the classroom context?*

The analysis of the regularity of use of AI in interaction with students and in the classroom context (Table 9) shows predominantly occasional use (64.8%, n=149), followed by rare use (23%, n=53). Only a small fraction of teachers frequently (8.7%, n=20) or always (1.3%, n=3) use AI, while

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2.2% (n=5) report never using it. These data suggest that despite the growing interest in AI, its integration into higher education is not yet systematic or widespread. The predominance of occasional use may reflect an exploratory phase, in which teachers test the technology without structural incorporation into pedagogical methods. Reduced use in frequent interactions may indicate challenges such as lack of specific training, ethical concerns, institutional limitations, or even resistance to adopting new technological approaches. The weak systematic adoption of AI in the classroom raises questions about its pedagogical effectiveness and the conditions necessary for more widespread implementation. To maximize the potential of AI in teacher-student interaction, institutional initiatives are needed that promote adequate training, access to specialized tools and guidelines on good practices in higher education.

Table 9. Regularity of use of AI for interaction with students and in the classroom context

Never	Rarely	Occasionally	Frequently	Always
2,2%	23%	64,8%	8,7%	1,3%
(*n= 5*)	(*n= 53*)	(*n=149*)	(*n= 20*)	(*n=3*)

Q10: *It is considered that, within the framework of teaching experience in the classroom context, the use of digital platforms has significant impacts on teaching and learning in terms of creating new forms of interaction and knowledge construction, regardless of geographical location, democratizing access to information and training in this area.*

When asked about the impact of digital platforms on the creation of new forms of interaction and knowledge construction, regardless of geographic location (Table 10), there is a widespread consensus on their benefits in teaching and learning. The vast majority of respondents (78.7%, n=181) recognize their contribution to the democratization of access to information and training, regardless of geographic location. Only 1.7% (n=4) did not identify a significant impact, while 18.7% (n=43) expressed uncertainty. These results reflect the growing appreciation of digital technologies as facilitators of teaching, promoting educational inclusion, pedagogical flexibility and methodological innovation. Its use allows for new interaction dynamics, expanding accessibility to knowledge and favoring hybrid and distance learning models.

However, the existence of a group that answers "maybe" suggests that challenges persist, such as digital inequality, difficulties in pedagogical adaptation and the need for teacher training for the effective use of these tools. The perception of limited impact among some teachers may be associated with the lack of adequate infrastructure or doubts about the quality of technology-mediated learning. These data highlight the importance of institutional strategies that guarantee accessible technological infrastructures, continuous teacher training, and good practices in the pedagogical integration of digital platforms to maximize their transformative potential in higher education.

Table 10. Use of digital platforms and significant impacts on teaching and learning

Yes	No	Maybe	Doesn't know	No response
78,7%	1,7%	18,7%	0%	0,9%
(*n= 181*)	(*n= 4*)	(*n=43*)	(*n= 0*)	(*n=2*)

Q11: *These tools, when integrated into the educational process, significantly benefit or affect the dynamics of teaching and learning.*

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When assessing the impact of the integration of these tools in the educational process (Table 11), the results point to a significant consensus regarding the impact of digital platforms on the dynamics of teaching and learning. The vast majority of respondents (76.1%, n = 175) consider that these tools benefit or significantly affect the educational process. Suggesting a largely positive perception or, at least, the recognition that its integration generates relevant changes in pedagogical practices. On the other hand, the answer "maybe", indicated by 20% (n = 46) of the participants, points to some ambivalence, possibly related to contextual factors, such as the degree of familiarity with the technologies, the training of the teachers or the suitability of the platforms to the different learning environments. The reduced number of negative responses (2.6%, n = 6) and uncertainty — "don't know" (0.4%, n = 1) and "does not respond" (0.9%, n = 2) — reinforces the idea that, despite there being specific reservations, there is widespread recognition of the relevance of these tools in the contemporary educational context.

These results can be interpreted in light of theories on pedagogical innovation, which argue that the impact of digital technologies is not limited to facilitating tasks, but extends to the transformation of teaching methodologies, forms of interaction and knowledge construction processes.

Table 11. Use of digital platforms and significant impacts on teaching and learning

Yes	No	Maybe	Doesn't know	No response
76,1%	2,6%	20%	0,4%	0,9%
(*n= 175*)	(*n= 6*)	(*n=46*)	(*n= 1*)	(*n=2*)

Q12: *Which of the following proposals would you recommend for future improvements within the scope of this articulation between AI and digital platforms associated with distance learning models?*

It becomes clear that the main concern of respondents regarding the integration of artificial intelligence (AI) and digital platforms in distance education (EaD) (Table 12) is centered on the need for training, updating and support for teachers (41.7%, n=96).

This result suggests that the effectiveness of technological adoption depends on the continuous training of teachers, allowing them to use digital tools efficiently and innovatively in teaching and learning.

The second biggest concern is digital inclusion and accessibility (30.4%, n=70), highlighting the importance of equity in access to educational technologies. This aspect reinforces the need for policies that guarantee the full participation of all students, regardless of their socioeconomic or geographical conditions. Although ethics and privacy in the use of AI represent a less significant concern (9.6%, n=22), this factor indicates the need for clear regulation and guidelines for the responsible implementation of these technologies in education. The growing concern about the ethical implications of the use of algorithms and the management of sensitive data, transparency, information security and respect for user privacy are critical aspects that must be integrated into the development and implementation of technological solutions for teaching.

The personalization of teaching (8.3%, n=19), the integration of emerging technologies (5.2%, n=12) and the development of new assessment tools (4.8%, n=11) reflect a growing interest in which adapt pedagogical models to the individual needs of students and in innovating assessment processes. These proposals point to the need to create learning experiences that are more adaptive, engaging and aligned with 21st century skills.

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Table 12. Proposals for improvements: articulation between AI and digital platforms associated with distance learning models

Improvement proposals	*n*	%
Improving teaching personalization	19	8,3
Development of more interactive and dynamic assessment tools	11	4,8
Training, updating and support for teachers on the management and use of AI and digital technologies	96	41,7
Ensure greater digital inclusion and accessibility	70	30,4
Strengthening Ethics and Privacy in the Use of AI	22	9,6
Integration of Emerging Technologies	12	5,2

The intersection of AI and education presents profoundly transformative potential, enabling the personalization of learning, the automation of administrative tasks, and the creation of more inclusive and accessible educational environments (Luckin et al., 2016). However, implementing AI in education requires careful consideration of fundamental ethical issues, such as protecting student data privacy and ensuring equity in access to technologies (Holmes et al., 2019). The success of this integration will depend on a balance between technological progress and social responsibility, ensuring that AI effectively contributes to reducing inequalities and improving the overall quality of education (Selwyn, 2019). Therefore, it is imperative that the adoption of AI in education is guided by an ethical, inclusive and sustainable approach.

6. Conclusion

The European Parliamentary Research Service (EPRS) "Ten Issues to Watch in 2025" report identifies AI competitiveness as one of the key areas of interest for the European Union (EU) in the near future. The main guidelines on AI are based on: 1) Competitiveness in AI; 2) Investment and Innovation; 3) Regulation and Ethics; 4) Education and Training; 5) International Collaboration. The report highlights the importance of the EU strengthening its position in developing and applying AI technologies to maintain and improve its global competitiveness. It emphasizes the need for significant investment in AI research and development, as well as the promotion of innovations that can be integrated into different sectors of the economy. The document addresses the importance of establishing regulations that guarantee the ethical and responsible use of AI, protecting citizens' rights and ensuring transparency in automated systems. He highlights the need for educational programs that prepare the workforce for the changes brought about by AI, ensuring that workers have the skills needed to interact with these new technologies. The report suggests that the EU should seek international partnerships for the joint development of AI technologies, ensuring global standards and sharing of best practices (EPRS, 2025).

The data analyzed show that the main advantage of distance learning is the autonomy granted to students. However, challenges remain, in particular the need to strengthen collaboration and the social impact of these approaches. This highlights the importance of strategies that reconcile autonomy and interaction, promoting more dynamic and inclusive pedagogical practices.

To mitigate the limitations of distance learning, it is essential to invest in digital accessibility, in the development of hybrid models (b-learning) and in the adoption of participatory methodologies that encourage active student involvement. It is observed that teachers' value above all the

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development of digital skills and preparation for the future as the main benefits of integrating digital platforms and Artificial Intelligence (AI) in teaching, highlighting the strategic relevance of these skills in the educational and professional context. The efficiency and automation of administrative tasks emerge as secondary, but still relevant, advantages, as they allow for the optimization of time and resource management.

The impacts of digital platforms, distance learning models, and AI transcend mere technological adoption, implying structural transformations in digital skills, access to knowledge, and innovation in pedagogical methods. To maximize these benefits, continuous infrastructure development, teacher training, and ensuring equity in access to technologies are essential. Integrating AI into education requires a strategic commitment that encompasses the efficiency and personalization of learning, ethical regulation, and the promotion of an inclusive and sustainable educational environment.

The frequency with which teachers use digital platforms suggests the need for differentiated strategies to encourage more consistent and effective use of distance learning. Investment in ongoing training, adequate technical support and the dissemination of good practices can be decisive in consolidating the adoption of these technologies in education.

In short, the results presented reinforce the importance of an integrated approach that combines the professional development of teachers, the promotion of digital inclusion and the consolidation of ethical and privacy principles. These factors are crucial to maximizing the potential of AI and digital platforms in distance learning, contributing to building more equitable, safe and innovative learning ecosystems.

7. Suggestion/Limitations

This research is not without limitations, and it is important not only to mention them, but also to leave some indications for future studies on this topic. Some of the limitations relate to the fact that it was a study carried out over a period of one month. In the future, it would be important to carry out a study with a longer time interval and, on the other hand, to assess in advance the ease of access of participants (sample and study population) to basic access tools (Internet) and to filling in the requested data (compatible operating systems).

Declarations

Author Contributions. E.G.M: Conceptualization, methodology, software, validation, formal analysis, investigation, resources, project administration; writing—original draft preparation, funding acquisition; L.L.: Visualization, formal analysis; writing—review and editing; A.P.: Visualization, funding acquisition; writing—review and editing; L.B.G.: Supervision, visualization, writing—review and editing; A.P.: Methodology; validation, formal analysis, investigation, resources, data curation, writing—review and editing, project administration. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest. The authors declare no conflict of interest.

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Appendix I.

Questionnaire

Question (Q)	Description
Q1	*Distance learning models most used in your teaching practice.*
Q2	*In general, what is the main benefit or advantage of using these modalities?*
Q3	*In general, what is the main disadvantage of using these modalities?*
Q4	*How regularly do you use digital platforms and distance learning models in the context of teaching and learning (as a teacher)?*
Q5	*When accessing knowledge (including research to prepare teaching activities), indicate how regularly you use AI.*
Q6	*What is the level of use of AI in your activity as a higher education teacher?*
Q7	*Indicate, in order of importance, based on your teaching experience, what is the main advantage in using and articulating digital platforms and AI in teaching and learning.*
Q8	*What impact does the use of digital platforms, distance models and AI have on the educational academic life that you observe, interact with and participate in directly?*
Q9	*How often is AI used to interact with students and in the classroom context?*

Q10	*Considers that, within the framework of teaching experience in the classroom context, the use of digital platforms has significant impacts on teaching and learning in terms of creating new forms of interaction and construction of knowledge, regardless of their geographical location, democratizing access to information and training in this area.*
Q11	*These tools, when integrated into the educational process, significantly benefit or affect the dynamics of teaching and learning.*
Q12	*Which of the following proposals would you recommend for future improvements within the scope of this articulation between AI and digital platforms associated with distance learning models?*

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