

DIGITAL COMPETENCIES OF TEACHERS FOR ASSESSMENT MEDIATED BY ARTIFICIAL INTELLIGENCE: A DIAGNOSTIC STUDY IN URUGUAYAN SECONDARY EDUCATION INSTITUTIONS

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Abstract

Uruguay has been a leader in integrating digital technologies into education, primarily through initiatives like Ceibal. However, the recent emergence of generative artificial intelligence (AI) presents a landscape of new and complex challenges for the education system. A gap has been identified between the availability of technology and its effective pedagogical integration, particularly in learning assessment. This context demands a deeper understanding of teachers' current competencies to address this shift.

The aim of this paper is to present the results of the initial diagnostic phase of the project "Strengthening digital competencies of secondary school teachers for AI-mediated assessment." Specifically, it seeks to describe and analyze the current state of digital competencies among secondary school teachers in 12 "María Espínola" secondary schools, identifying their perceptions, uses, and barriers related to the use of AI in assessment practices.

A questionnaire (CCDD-IA) was designed and administered to teachers at secondary schools in 10 departments across the country. The instrument, which includes the areas covered by the DigCompEdu questionnaire and adds an area related to the use of AI for learning assessment, combined Likert-type scales and open-ended questions to explore four dimensions: 1) Self-perception of general and specific digital competencies in AI; 2) Current use of digital and AI tools in teaching and assessment; 3) Perceived barriers (institutional, personal, pedagogical); and 4) Interest in and needs for training. A descriptive-quantitative analysis of the data was performed.

To date, 187 valid responses have been analyzed. Preliminary results indicate that, although there is a high level of awareness about the relevance of AI in education (more than 72.8% consider it "important" or "very important"), however, 25.1% stated that they do not use these tools and 34.8% stated that they use them sometimes. The use of digital tools remains focused on administrative or presentation tasks (e.g., platforms, word processors), with the use of AI for evaluating learning outcomes or providing personalized feedback on assessments being almost non-existent.

The main barriers identified are not a lack of equipment, but rather a "lack of time" to explore tools, a "lack of knowledge of reliable pedagogical applications," and a "lack of specific training."

The findings from this diagnostic phase confirm the urgent need to move beyond mere "digital inclusion" to the "pedagogical appropriation" of AI in secondary education. Teachers are currently at a point of "receptive interest," but require structured training to overcome the identified pedagogical and time constraints. This data is the primary input for the design of Phase 2 of the project, which will implement a skills development plan focused on assessment, directly addressing the needs identified in this study.

Keywords: Secondary education, digital teaching skills, artificial intelligence, assessment.

1 INTRODUCTION

Uruguay has established regional leadership in the integration of digital technologies in education through Ceibal. However, the emergence of generative artificial intelligence (AI) has reshaped the educational landscape, presenting multiple challenges. Technology does not inherently guarantee educational improvement; in the post-pandemic context, the digital divide has shifted toward the capacity for critical pedagogical appropriation. This study is situated within the "María Espínola" schools (CME), secondary education institutions that prioritize innovation and equity in vulnerable contexts.

The theoretical framework is grounded in Educator Digital Competencies (EDC) under the DigCompEdu model [1]. Teaching competence must evolve toward a perspective of creation and curation of learning environments. Recent research by Cabero-Almenara et al. [2] and García-Peñalvo [3] underscores that the integration of advanced technologies can enhance the precision and inclusivity of assessment, provided it is mediated by situated training. Similarly, authors such as Holmes et al. [4] and Miao and

Cukurova [5] highlight the potential of AI for the personalization of instruction and the automation of feedback—key areas for addressing classroom diversity.

Nevertheless, significant barriers remain. Reports from the National Institute for Educational Evaluation (INEEd) [6] and studies by Coitinho and González [7] indicate that a high percentage of secondary school teachers still do not feel prepared to conduct assessments in digital environments. This resistance, coupled with the ethical and privacy challenges highlighted by UNESCO [8], creates a gap between teacher interest and the genuine incorporation of AI. As Questa-Tortero et al. [9] indicate in a previous pilot study, teachers perceive AI as a promising tool but express significant uncertainty due to the lack of specific training.

Under these considerations, the purpose of this communication is to present the results of the initial diagnostic phase of the project "Strengthening Secondary Education Teachers' Digital Competencies for AI-Mediated Assessment." Specifically, it seeks to describe and analyze the current state of digital competencies among teachers at 12 "María Espínola" secondary schools, identifying their perceptions, use patterns, and primary barriers regarding the pedagogical use of AI. This analysis constitutes the critical input for designing a training strategy to transform receptive interest into a solid, ethical, and situated pedagogical competence.

2 METHODOLOGY

The present study adopts a mixed-methods research design, integrating quantitative and qualitative approaches for competency assessment, complemented by an applied research dimension for the co-design of a training intervention. This methodological approach provides a comprehensive framework to address the complexity of Educator Digital Competencies (EDC) and the barriers to Artificial Intelligence (AI) adoption, offering a basis for generating situated and scalable solutions. The emphasis of this report is placed on the quantitative diagnostic phase, which identifies general patterns and statistical trends regarding teacher self-perception of EDC development, specifically concerning the pedagogical use of AI.

The target population consists of secondary education teachers from the "María Espínola" schools (CME) in Uruguay—institutions characterized by their focus on educational inclusion and pedagogical innovation within vulnerable contexts. The final sample analyzed for this quantitative report comprises 187 valid responses from teachers distributed across 10 departments of the country.

Data collection was conducted using the CCDD-IA questionnaire, an instrument designed based on the adaptation of the European DigCompEdu framework by the Uruguayan Ministry of Education and Culture. The original instrument, previously validated and tested in national contexts, was supplemented by the research team with a specific block of items aimed at measuring self-perception and AI use in learning assessment.

The instrument combines Likert-type scales to measure frequencies and levels of agreement, alongside closed-ended sociodemographic and professional characterization questions. The version utilized was previously pilot-tested in a study involving Uruguayan secondary school teachers outside the target population of this study [10].

This report focuses on the following aspects surveyed through the questionnaire: 1) Self-perception of general and AI-specific digital competencies; 2) Current usage of digital and AI tools in teaching and assessment practices; 3) Perceived barriers (institutional, personal, and pedagogical), 4) Interests and professional development needs.

Data analysis was performed using descriptive and inferential statistical techniques. Measures of central tendency and dispersion were calculated for competency and usage items. Additionally, hypothesis testing was conducted to identify significant differences between groups (teachers with and without prior AI training), utilizing a significance level of $p < .05$. This quantitative analysis constitutes the fundamental input for the intervention phase, guiding the co-design of the training proposal toward the identified technical and pedagogical needs.

3 RESULTS AND DISCUSSION

This section presents and discusses findings regarding the surveyed teachers' perceptions of the pedagogical relevance of AI and the extent to which they incorporate these technologies into their professional practices. Furthermore, the study explores the specific tools utilized and their intended applications, as well as the challenges identified for their integration into teaching. Finally, the analysis

addresses the role of teacher training and its connection to the process of appropriating these emerging technologies.

3.1 Pedagogical relevance of AI and self-perceived competencies for integration into educational practices

The analysis of teacher perceptions reveals an optimistic attitude toward the incorporation of Artificial Intelligence (AI) into educational practices. When inquiring whether this technology is considered an opportunity for the professional role (Item A8.3b), 72.8% of the sample expressed a favorable stance. This outlook is complemented by the perspective on the impact of these tools on teaching quality (Item A8.6), where 58.3% of teachers maintain that their integration has the potential to enhance educational processes. These data align with the assertions of several authors [2] [3] [4] [5], suggesting that the teaching staff recognizes the potential of AI to improve their daily tasks.

However, a significant gap emerges when contrasting these expectations with the reported level of implementation. Despite the positive valuation of its pedagogical potential, the use of AI tools in daily practice remains nascent. Data indicate that one-quarter of teachers claim not to use any such tools, while the most widespread mode of use is occasional, with 34.8% stating they use them only "sometimes." Such evidence is consistent with the findings reported by INEEd [6] and the study conducted by Coitinho and González [7].

3.2 AI tools used by teachers and their purposes

Regarding those who utilize AI tools, it is pertinent to identify which ones are integrated into their teaching practices, as surveyed in item A8.8 of the CDD-IA questionnaire. The most frequently cited tools are content generation platforms such as ChatGPT, Gemini, and Canva. Some teachers reported using specific-purpose tools such as Gamma (for presentations), Perplexity (for searching), and DALL·E (for image generation). Respondents also mentioned the AI features provided by the Crea (Schooly) platform and, to a lesser extent, other specific instructional support tools.

When exploring the dimensions of AI's practical application, it is observed that its use in academic performance assessment processes is markedly marginal. Although an optimistic view prevails regarding the potential of these technologies, 75.4% of the surveyed teachers state they have never used AI tools to assess student performance (Item A8.9). This data reveals that, in the realm of assessment and student progress monitoring, traditional or conventional digital methods continue to prevail over automated or AI-assisted solutions, despite the relevance reported by authors such as García-Peñalvo [3].

This trend is further intensified when analyzing the technology's capacity for personalized learning (Item A8.13 of the CDD-IA questionnaire). A phenomenon of dissonance is identified between pedagogical expectation and practical application: of the 187 teachers in the sample, 89 professionals agree that AI can elevate teaching quality; however, nearly the entire subgroup (83 teachers) declares never having used these tools to provide personalized feedback to their students.

3.3 Challenges for the integration of AI into practice

The identification of barriers to AI adoption in assessment processes (Item A8.17) highlights the challenges that teachers consider decisive. The lack of specific training stands as the primary obstacle, cited by 88.8% of respondents. This finding correlates with previous data regarding low self-perceived competence and supports the notion that the absence of specific training conditions the integration of these tools. These findings coincide with those reported in other studies, such as those published by INEEd [6] and Questa-Tortorolo et al. [9].

At a second level of relevance are ethical concerns, identified by 69.5% of teachers—aspects also underscored by UNESCO [8]. This indicates apprehension regarding the implications of using algorithms in student assessment, likely encompassing issues of privacy, bias, and transparency. Furthermore, resistance to change and lack of resources were noted by 58.8% and 55.6% of the sample, respectively.

3.4 Teacher training as a driver of pedagogical appropriation of AI

Teacher training emerges as a pivotal factor in fostering the pedagogical appropriation of AI in learning assessment. Although teachers exhibit general knowledge of AI tools applied to education (Item A8.1), they do not report being fully conversant with their pedagogical application, revealing a gap between

technological access and effective integration into classroom practices. Similar findings were reported by INEE [6] and Coitinho and González [7].

Of the 187 surveyed teachers, 54% have not received specific training on the use of AI in education (Item A8.2). However, when comparing self-reported familiarity with these tools between groups with and without training, a significant difference is observed: trained teachers report a significantly higher mean level of familiarity ($p < .001$). This training directly impacts the practical integration of AI. Conversely, in the group without specific training, more than half (51.5%) integrate AI tools into their practice, with approximately one-fifth using them frequently. This may be attributed to self-directed learning or peer-to-peer training. In contrast, among teachers with training, this integration rises to 70.9%, suggesting that formal capacity-building fosters greater confidence and pedagogical application.

Nonetheless, the study detects a paradox in current professional development, noting that the correlation between participation in online training courses (Item A1.4, which is above the area average) and their practical application remains weak. This weakness is reinforced by the low levels recorded in active skill development (Item A1.3), with values falling below the average for the digital competence area. Likewise, the high heterogeneity of responses in training indicators suggests a fragmented distribution of knowledge within the teaching collectives of the studied schools. These findings confirm that passive attendance at training programs is inherently insufficient; there is a need for training initiatives that prioritize active experimentation to transform teacher interest into a solid, ethical, and situated pedagogical competence that translates into genuine inclusive practices in the classroom.

4 CONCLUSIONS

The discrepancy between the recognized pedagogical value and the actual integration of AI indicates that, while the initial attitudinal barrier has been overcome by validating technology as a driver for educational quality improvement, other factors hinder the translation of this perception into concrete implementation. Educators are currently in a state of "receptive interest," characterized by a high theoretical valuation of the resource alongside limited technical appropriation. This underscores the need for interventions that facilitate the transition from the recognition of opportunity toward effective and sustained pedagogical application.

Significantly, the lack of resources was the least frequently cited barrier among the analyzed options. This suggests that, within the context of the "María Espínola" schools, teachers perceive the primary challenge not as a matter of technological infrastructure availability, but rather as the development of human capacities and the resolution of pedagogical and ethical dilemmas. Taken together, these results demonstrate that strengthening digital competence in AI requires a comprehensive approach that transcends the provision of equipment, prioritizing professional development strategies that address both the operational dimension and the ethical framework of professional application.

The low incidence of AI utilization for feedback purposes suggests that the teaching staff has yet to integrate AI capabilities into one of the most critical tasks of formative assessment. The identified gap does not stem from a lack of confidence in the tool's potential, but rather from the difficulty of operationalizing that potential into concrete actions that enhance personalized instruction.

These findings underscore the need for structured professional development programs that transcend mere attendance and accreditation, prioritizing active skill development to overcome temporal and pedagogical barriers to AI integration in assessment. Furthermore, these results reinforce the notion that the pedagogical appropriation of AI within the "María Espínola" schools remains in a phase of conceptual exploration, with significant scope for the development of applied competencies in assessment and feedback.

ACKNOWLEDGEMENTS

The results presented in this contribution are part of a project funded by the National Agency for Research and Innovation of Uruguay (ANII) and Fundación Ceibal in the 2024 call of the Education Sector Fund, modality "Digital Inclusion (FSED_2_2024_1_183811).

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