# Artificial Intelligence Literacy as a Challenge for Higher Education - A case study at the Portalegre Polytechnic University

Eduardo O. Lérias [1,*], Cristina G. Guerra [2], and Paulo Ferreira [3]

[1]Portalegre Polytechnic University, 7350-092 Portalegre, Portugal
[2] Portalegre Polytechnic University, 7350-092 Portalegre, Portugal, CIQV - Life Quality Research Center, 2001-904 Santarém - Portugal
[3] Portalegre Polytechnic University, 7350-092 Portalegre, Portugal and VALORIZA-Research Center for Endogenous Resource Valorization, 7300-555 Portalegre, Portugal
Email: 24201@ipportalegre.pt (E.L.); cristinag@ipportalegre.pt (C.G.); pferreira@ipportalegre.pt (P.F.)
*Corresponding author

***Abstract* — This study analyses artificial intelligence (AI) literacy in higher education, using the Portalegre Polytechnic University (PPU) as a case study. The main objective was to examine self-reported AI literacy profiles among faculty and students, identifying perceived competences, weaknesses, and pedagogical implications. A psychometrically validated questionnaire was applied, supported by descriptive statistical analysis and critical interpretation.**

**The descriptive results show an intermediate level of self-reported AI literacy in both groups, although with distinct perceived profiles. Faculty members report higher perceived conceptual understanding of AI, while students show higher mean scores in several applied and adaptive dimensions, particularly ethical awareness and learning. Faculty members reveal limitations in continuous learning and keeping up with technological advances. Students, on the other hand, display high self-confidence in self-management and resistance to algorithmic persuasion, while showing relevant weaknesses in technical understanding and deeper conceptual engagement with AI. The widespread use of AI tools, particularly ChatGPT, confirms their integration in academic practices but raises critical challenges regarding integrity, self-regulation, and assessment.**

**The study concludes that AI literacy should be considered a strategic priority in higher education, requiring dynamic and multidisciplinary training programs that integrate technical, cognitive, and ethical competences. Such initiatives are essential to foster responsible and critical use of AI in educational contexts.**

***Keywords*— Artificial intelligence literacy, Higher education, Teachers, Students, Ethics, Regulation, Digital education**

## I. INTRODUCTION

Artificial Intelligence (AI) is reshaping higher education, transforming teaching practices, learning processes, and students' experiences [1]. While AI offers significant opportunities to enhance learning, it also raises critical ethical, pedagogical, and social challenges, particularly regarding its responsible and informed use [2].

In this context, AI literacy has emerged as a key competence [3, 4], encompassing not only technical knowledge but also cognitive, behavioural, and ethical dimensions required to effectively and critically interact with AI systems [4]. Existing literature highlights that AI literacy involves understanding, using, and evaluating AI technologies, as well as making informed and ethical decisions about their application [5]. Despite its growing importance, there is still limited empirical evidence comparing AI literacy profiles between students and faculty, particularly within higher education institutions. Recent studies have begun to explore AI literacy in higher education contexts, including case-based analyses in specific institutions, such as the Portalegre Polytechnic University [6].

Addressing this gap, this study aims to compare self-reported artificial intelligence literacy profiles between students and faculty in higher education, identifying perceived competencies and gaps across different dimensions. By doing so, it provides empirical insights into how these groups report different patterns of understanding, use, and perceived critical engagement with AI, highlighting implications for teaching, learning, and institutional strategies.

## II. LITERATURE REVIEW

The concept of AI literacy has emerged from the broader discussion on digital literacy, which moved beyond basic technical ability to include the capacity to understand, interpret, and critically use digital technologies [7]. When artificial intelligence is introduced into this debate, the concept becomes more complex, since AI literacy does not refer only to the operational use of AI-based tools, but also to the cognitive, social, emotional, and ethical competences required for their responsible use [4]. In this sense, AI literacy has been defined as a set of competences that enables individuals to critically evaluate AI technologies, communicate and collaborate with them, and use them effectively in different contexts [5].

In educational settings, this discussion is particularly relevant. The literature shows that AI in education has significant potential to support teaching and learning processes, including adaptive learning, intelligent tutoring systems, diagnostic tools, recommender systems, and other forms of educational support [1]. At the same time, its growing adoption has raised concerns related to pedagogy, ethics, privacy, autonomy, and the possible weakening of teacher–student interaction if such systems are used uncritically [2]. Ethical and reliable use of AI in education therefore requires attention to principles such as transparency, accountability, inclusion, privacy, safety, and human-centred design [8].

Despite the growing relevance of this topic, the measurement of AI literacy remains a challenge [10]. Existing conceptualizations differ in the number and configuration of dimensions involved, although the literature frequently converges around core dimensions such as understanding AI, using and applying AI, evaluating AI, and AI ethics [4]. In this context, the instrument developed by

https://doi.org/10.34630/cip.vi.7657

Carolus et al. was particularly relevant for the present study, as it provides a modular and psychometrically validated scale that includes not only AI literacy itself, but also AI self-efficacy and AI self-management [9]. This multidimensional approach is especially useful in higher education, where both faculty and students are increasingly exposed to AI tools, but may differ substantially in their competences, perceptions, and readiness to engage with them critically and responsibly.

## III. Materials and Methods

This study adopts a quantitative exploratory approach to analyse and compare self-reported artificial intelligence (AI) literacy levels between students and faculty in a higher education context. The empirical study was conducted at the PPU, involving two distinct samples: 75 faculty members and 192 students, ensuring a relevant basis for comparative analysis (Table 1).

Table 1. Sample Characterization

| Variable | Faculty (n=75) | Students (n=192) |
|---|---|---|
| Age (≥ 40 years)[1] | 91.9% | 15.1% |
| Gender (% female) | 54.7% | 62.0% |
| Main School (% largest) | ESTGD[2] (40%) | ESTGD (50.5%) |

[1] The ≥ 40 years threshold was used as a compact demographic indicator to distinguish the predominantly mid- and late-career faculty profile from the predominantly younger student population, while avoiding excessive fragmentation of age categories in a short conference paper.
[2] ESTGD – School of Technology, Management and Design.

Data were collected using a structured questionnaire based on the validated instrument developed by Carolus et al. [9], which assesses AI literacy through multiple dimensions, including "understanding AI," "using and applying AI," "detecting AI," and "AI ethics," as well as complementary dimensions such as AI self-efficacy and AI self-management.

In this study, "using and applying AI" refers to the perceived ability to use AI tools in everyday and academic contexts; "understanding AI" captures familiarity with AI concepts, definitions, opportunities, and limitations; "detecting AI" assesses the perceived ability to recognise AI-based systems and AI-mediated interactions; and "AI ethics" refers to the perceived ability to evaluate social and ethical consequences of AI use. The complementary dimensions assess perceived self-efficacy in AI-related problem-solving and learning, as well as AI self-management, including AI persuasion literacy and emotional regulation during AI interactions.

The instrument was adapted to the study context and administered online. Participation was voluntary, anonymous, and confidential, and informed consent was obtained from all individual participants included in the study.

Data analysis was performed using statistical software (SPSS), applying descriptive statistics to identify patterns and compare self-reported AI literacy profiles between faculty and students. Dimension scores were calculated as the mean of the corresponding questionnaire items. Given the exploratory and case-study nature of the research, the analysis focuses on descriptive comparison rather than statistical generalization. Therefore, the observed differences between groups should be interpreted as indicative patterns within the PPU sample, rather than as inferential evidence of statistically significant differences in the wider higher education population.

The reliability of the instrument was confirmed through Cronbach's alpha ($\alpha = 0.942$), indicating excellent internal consistency, and the suitability for factor analysis was validated through the Kaiser–Meyer–Olkin measure (KMO = 0.907) and Bartlett's test of sphericity ($p < 0.001$). Although the analysis is primarily descriptive, the observed differences between groups suggest consistent patterns that warrant further inferential validation in future studies.

## IV. Results and Discussion

The results reveal an overall intermediate level of self-reported AI literacy in both groups, although with distinct perceived profiles between students and faculty (Fig. 1). The comparative analysis highlights relevant differences across key dimensions, particularly in conceptual understanding and learning-related competencies, while differences in ethical awareness and other dimensions vary between groups.

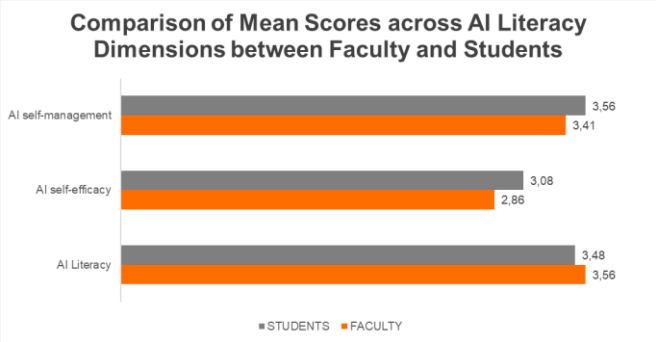


Fig. 1. Comparison of Mean Scores across AI Literacy Dimensions between Faculty and Students

A closer examination of the results (Table 2) shows that faculty members show higher scores in dimensions related to conceptual understanding and application of AI. Specifically, faculty show higher mean scores in "understanding AI" (3.46 vs. 3.24) and "using and applying AI" (3.85 vs. 3.39), reflecting a more structured and operational engagement with AI systems. However, students show higher mean scores than faculty in several other dimensions, including "AI ethics" (3.83 vs. 3.73), "detecting AI" (3.45 vs. 3.20), "problem-solving" (3.32 vs. 3.23), "learning" (2.84 vs. 2.49), and "AI persuasion literacy" (3.64 vs. 3.27). These results suggest that students report stronger perceived adaptability, greater familiarity with AI-generated content, and responsiveness to evolving technological contexts. While faculty members exhibit stronger conceptual understanding, students tend to report higher scores in several applied and adaptive dimensions, including ethical awareness and AI persuasion literacy.

Table 2. Mean Scores by Dimension for Faculty and Students

| Dimensions / Factors | | Faculty | Students |
|---|---|---|---|
| **AI Literacy** | Using and applying AI | 3.85 | 3.39 |
| | Understanding AI | 3.46 | 3.24 |
| | Detecting AI | 3.20 | 3.45 |
| | AI Ethics | 3.73 | 3.83 |
| **AI Self-efficacy** | Problem-solving | 3.23 | 3.32 |
| | Learning | 2.49 | 2.84 |
| **AI Self-management** | AI persuasion literacy | 3.27 | 3.64 |
| | Emotional regulation | 3.55 | 3.48 |

However, faculty members also present the lowest scores in "learning" (2.49), indicating relevant limitations in continuous learning and adaptation to technological developments. This result is particularly relevant given the rapid evolution of AI technologies and the increasing need for ongoing professional development in higher education contexts.

These higher student mean scores in "detecting AI" (3.45 vs. 3.20) and "AI persuasion literacy" (3.64 vs. 3.27) suggest a stronger perceived ability to recognize and manage AI-generated content.

Despite this, students exhibit lower mean scores in "understanding AI" (3.24) and "using and applying AI" (3.39 vs. 3.85), suggesting a gap between interaction and conceptual comprehension.

These findings are consistent with previous conceptualizations of AI literacy as a multidimensional construct, rather than as a purely technical skill [4], [5]. The observed distinction between operational use, conceptual understanding, ethical awareness, and self-management supports the view that AI literacy cannot be reduced to familiarity with AI tools. In line with previous work on AI literacy assessment among university students [10], the results suggest that frequent interaction with AI systems does not necessarily correspond to deeper conceptual understanding.

Additionally, the results indicate a widespread use of AI tools among students, particularly generative AI systems, in academic tasks. As illustrated in Figure 2, a majority of students report using AI to support academic activities, while a smaller but relevant proportion admit using these tools in unauthorized contexts. This pattern reinforces both the growing integration of AI into learning practices and the emerging challenges related to academic integrity, self-regulation, and assessment design.

The findings suggest a mismatch between students' reported confidence in using AI tools and their lower self-reported conceptual understanding of AI. While students report confidence in interacting with AI tools, this confidence is not accompanied by equally strong scores in conceptual understanding. This discrepancy suggests a predominantly instrumental use of AI, where tools are used at a functional level, but without equivalent perceived comprehension of their underlying logic, limitations, or potential biases.

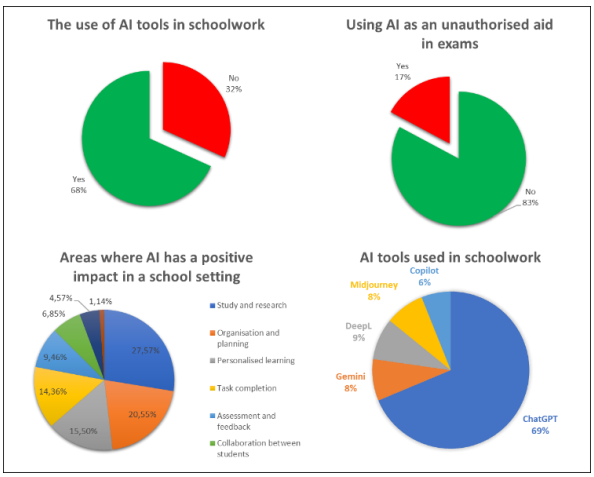


Fig. 2. Use of AI Tools in Academic Contexts by Students (based on student responses, n=192)

This study identifies a perceived gap between confidence in AI use and conceptual understanding among students. This perceived gap has important implications in higher education, as it may lead to an overreliance on AI systems without adequate critical evaluation. In this context, the use of AI can evolve into a form of cognitive delegation [11], where students increasingly rely on AI to perform tasks that would otherwise require individual reasoning and knowledge construction. While this may enhance efficiency, it also raises concerns regarding the development of higher-order cognitive skills and long-term learning outcomes.

In contrast, faculty members report a profile marked by stronger conceptual understanding and a more structured critical perspective on AI, although not consistently higher scores in ethical awareness. This suggests a more structured and potentially more reflective approach to AI, aligned with their role in guiding learning processes. However, the lower scores observed in continuous learning highlight a significant vulnerability: faculty may not perceive themselves as adapting at the same pace as technological developments. This creates a potential disconnect between pedagogical knowledge and technological practice, limiting the effective integration of AI into teaching.

These contrasting profiles point to a structural asymmetry in higher education. Students tend to be more active and confident users of AI technologies, while faculty members exhibit a more critical but less adaptive stance. This imbalance generates a pedagogical tension, where the most frequent users of AI are not necessarily those with the deepest understanding, and those with stronger conceptual knowledge are not always those integrating AI into practice.

The widespread use of AI tools by students, as evidenced in Figure 2, reinforces this dynamic. The presence of unauthorized use highlights the limitations of traditional assessment models and suggests the need for a reconfiguration of evaluation practices. This also aligns with previous research highlighting that the adoption of AI in education raises not only technological questions, but also ethical, pedagogical, and institutional challenges [2], [8].

From an educational perspective, these results support the view that AI literacy should be approached as a multidimensional construct, integrating technical, cognitive, ethical, and self-regulatory dimensions [4]. The differences identified between students and faculty highlight the need for differentiated and complementary intervention strategies. Students require the development of deeper conceptual understanding, critical thinking, and learning autonomy, while faculty need structured support for continuous professional development and for the practical integration of AI into teaching and assessment practices.

As the analysis is descriptive, the differences observed between faculty and students should be interpreted as profile tendencies rather than statistically tested group effects. Nevertheless, these tendencies are relevant for an exploratory case study, as they help identify areas where targeted institutional intervention may be needed.

## V. Conclusion

This study provides descriptive empirical evidence on self-reported AI literacy in higher education, highlighting relevant profile differences between students and faculty. While both

groups report an overall intermediate level of AI literacy, their profiles reveal distinct strengths and weaknesses that reflect different patterns of engagement with AI technologies.

The findings show that students report frequent and confident use of AI tools, but also reveal lower self-reported conceptual understanding and weaker engagement with the underlying principles and limitations of AI. In contrast, faculty members report stronger conceptual understanding of AI, while students report higher perceived competence in several applied and adaptive dimensions, including ethical awareness and learning capacity. Faculty members, in particular, reveal relevant limitations in continuous learning and technological adaptation. This asymmetry suggests a structural imbalance in higher education, where use does not necessarily imply understanding, and knowledge does not always translate into effective practice.

From an educational perspective, these results reinforce the need to approach AI literacy as a multidimensional competence, integrating technical, cognitive, ethical, and self-regulatory dimensions. The differences identified between students and faculty highlight the importance of developing targeted strategies: strengthening critical understanding and learning autonomy among students, while promoting continuous training and practical integration of AI among faculty.

This study contributes to the growing body of research on AI in education by providing a comparative perspective on AI literacy profiles within a higher education institution. However, it is limited to a single institutional context, which may restrict the generalizability of the findings. Future research should expand this analysis to other institutions and educational systems, as well as explore the impact of structured AI literacy interventions on teaching and learning outcomes.

## Conflict of Interest

The authors declare no conflict of interest.

## Author Contributions

E.L. conducted the research, analyzed the data and wrote the paper; C.G. and P.F. supervised and validated the research; all authors approved the final version.

## References


[1] T. Bates, *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning*, Vancouver, BC: Tony Bates Associates Ltd, 2017.

[2] N. Humble and P. Mozelius, "The threat, hype, and promise of artificial intelligence in education", *Discover Artificial Intelligence*, vol. 2, no. 1, p. 22, 2022, doi: 10.1007/s44163-022-00039-z.

[3] D. Cetindamar, K. Kitto, M. Wu, Y. Zhang, B. Abedin, and S. Knight, "Explicating AI literacy of employees at digital workplaces", *IEEE Trans. Eng. Manag.*, vol. 71, pp. 810–823, 2024, doi: 10.1109/TEM.2021.3138503.

[4] D. T. K. Ng, J. K. L. Leung, S. K. W. Chu, and M. S. Qiao, "Conceptualizing AI literacy: An exploratory review", *Computers and Education: Artificial Intelligence*, vol. 2, 2021, p. 100041, doi: 10.1016/j.caeai.2021.100041.

[5] D. Long and B. Magerko, "What is AI literacy? Competencies and design considerations", in *Proc. 2020 CHI Conference on Human Factors in Computing Systems*, 2020, pp. 1–16, doi: 10.1145/3313831.3376727.

[6] E. Lérias, C. Guerra, and P. Ferreira, "Literacy in Artificial Intelligence as a Challenge for Teaching in Higher Education: A Case Study at Portalegre Polytechnic University", Information, vol. 15, no. 4, p. 205, 2024, doi: 10.3390/info15040205.

[7] P. Miranda, P. Isaias, and S. Pifano, "Digital literacy in higher education: A survey on students' self-assessment", in *Learning and Collaboration Technologies. Learning and Teaching*, P. Zaphiris and A. Ioannou, Eds., vol. 10925, Cham: Springer, 2018, pp. 71–87, doi: 10.1007/978-3-319-91152-6_6.

[8] A. Nguyen, H. N. Ngo, Y. Hong, B. Dang, and B.-P. T. Nguyen, "Ethical principles for artificial intelligence in education", *Education and Information Technologies*, vol. 28, no. 4, pp. 4221–4241, 2023, doi: 10.1007/s10639-022-11316-w.

[9] A. Carolus, M. J. Koch, S. Straka, M. E. Latoschik, and C. Wienrich, "MAILS – Meta AI Literacy Scale: Development and validation of a multidimensional AI literacy measurement", *Computers in Human Behavior: Artificial Humans*, vol. 1, no. 2, p. 100014, 2023, doi: 10.1016/j.chbah.2023.100014.

[10] M. Hornberger, A. Bewersdorff, and C. Nerdel, "What do university students know about artificial intelligence? Development and validation of an AI literacy test", *Comput. Educ.: Artif. Intell.*, vol. 5, p. 100165, 2023, doi: 10.1016/j.caeai.2023.100165.

[11] A. D. Figueiredo, "Inteligência artificial generativa e construção de conhecimento", presented at the Processamento de Linguagem Natural: Tendências e Aplicações Práticas, Coimbra, Portugal, Jun. 30, 2023, doi: 10.13140/RG.2.2.25801.52328.



Copyright © 2026 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (CC BY 4.0).