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AI-Supported Scientific Knowledge Development in Higher Education: The Role of AI Literacy among University Students

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Abstract

The research investigates how digital competence, prior experience with AI technologies, and attitudes toward artificial intelligence influence students' AI literacy, as well as how AI literacy contributes to the development of scientific knowledge supported by AI tools. A quantitative, cross-sectional survey was conducted with 274 university students. Data were collected through a structured questionnaire and analyzed using descriptive statistics, reliability testing, correlation analysis, and regression analysis. The findings reveal that digital competence, experience with AI technologies, and positive attitudes toward AI are significant predictors of AI literacy, jointly explaining 52% of its variance. Furthermore, AI literacy significantly influences AI-assisted scientific knowledge development, accounting for 40% of the variance in this outcome. These results demonstrate that students with higher levels of AI literacy are better equipped to use AI tools for exploring academic information, analyzing scientific knowledge, and generating scholarly ideas. The study highlights AI literacy as a key competence for effective and responsible engagement with artificial intelligence in higher education. By emphasizing the importance of developing students' AI-related skills and understanding, the research contributes to the growing body of literature on AI in education and underscores the need to integrate AI literacy into higher education curricula to enhance academic learning and knowledge development

Keywords: *AI literacy, artificial intelligence in education, scientific knowledge development, higher education, AI-supported learning*

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Introduction

In recent years, the integration of AI-based systems into educational environments has expanded considerably, influencing teaching practices, learning processes, and knowledge production within higher education institutions. AI technologies such as intelligent tutoring systems, generative AI tools, learning analytics, and natural language processing applications are increasingly used to support personalized learning, facilitate access to information, and enhance students' academic performance. As a result, artificial intelligence has become an important driver of innovation in higher education systems worldwide (Ouyang, Jiao, 2021; Zawacki-Richter et al., 2019; Crompton & Burke, 2023).

The growing presence of AI in higher education has also transformed the ways in which students interact with knowledge and construct academic understanding. Traditionally, the development of scientific knowledge among students has been associated with activities such as exploring scholarly literature, analysing theoretical concepts, critically evaluating information, and producing academic arguments. However, the emergence of AI tools has introduced new possibilities for supporting these processes. Students increasingly rely on AI-powered applications to identify relevant literature, summarise complex texts, generate explanations, and organise academic ideas.

These technologies function as cognitive support systems that can facilitate knowledge exploration and support the development of academic reasoning (Luckin et al., 2016; Ouyang, Jiao, 2021).

Recent studies suggest that AI technologies may play a significant role in supporting knowledge construction processes in higher education.

Through capabilities such as automated information retrieval, content generation, and interactive feedback, AI tools can support students in understanding complex academic concepts and synthesizing large amounts of information. In this context, AI has the potential to act not only as an information access tool but also as a

facilitator of scientific knowledge development. Consequently, the relationship between artificial intelligence and academic knowledge construction has become an increasingly important research topic in the field of educational technology (Zawacki-Richter et al., 2019; Crompton & Burke, 2023). At the same time, the effective use of artificial intelligence in academic contexts depends largely on students' competencies in understanding and interacting with AI systems. This has led to growing scholarly interest in the concept of AI literacy, which refers to the knowledge, skills, and critical understanding required to interact effectively with artificial intelligence technologies. AI literacy encompasses the ability to understand how AI systems work, evaluate AI-generated outputs, and use AI tools responsibly and ethically (Long, Magerko, 2020, 2026).

Developing AI literacy has become increasingly important in higher education, particularly in the context of the widespread adoption of generative AI technologies. Students who possess higher levels of AI literacy are more likely to use AI tools critically and effectively in academic contexts, thereby enhancing their learning processes and knowledge construction capabilities. Conversely, limited understanding of AI systems may lead to superficial use of these technologies, potentially affecting students' ability to engage critically with academic information.

Despite the growing body of research on artificial intelligence in education, relatively few studies have explored the relationship between AI literacy and the development of scientific knowledge among university students. Much of the existing literature focuses primarily on the technological applications of AI in education, such as adaptive learning systems or automated assessment tools. However, there is still limited empirical evidence regarding how AI competencies influence students' ability to explore, analyse, and produce scientific knowledge in higher education contexts. Understanding this relationship is particularly important as

universities increasingly incorporate AI tools into academic activities and research practices (Crompton & Burke, 2023).

Given these developments, examining the role of AI literacy in supporting scientific knowledge development among university students represents an important research direction. By analysing how students use AI tools to explore academic information, develop conceptual understanding, and generate scholarly ideas, researchers can gain deeper insights into the pedagogical implications of artificial intelligence in higher education. Furthermore, understanding these relationships can inform the design of educational strategies that promote responsible and effective use of AI technologies in academic learning environments.

Therefore, the aim of this study is to investigate the role of AI literacy in AI-supported scientific knowledge development among university students in higher education. Specifically, the study explores how students' digital competence, experience with AI technologies, and attitudes toward artificial intelligence influence AI literacy, and how AI literacy, in turn, contributes to the development of scientific knowledge supported by artificial intelligence tools.

Literature Review

Artificial Intelligence in Higher Education

The rapid advancement of artificial intelligence technologies has significantly influenced the landscape of higher education in recent years. Artificial intelligence is increasingly integrated into educational systems through applications such as intelligent tutoring systems, adaptive learning platforms, automated assessment tools, and generative AI technologies. These systems have the potential to enhance teaching and learning processes by supporting personalized learning experiences, facilitating access to information, and improving student engagement (Ouyang, Jiao, 2021, Zawacki-Richter et al., 2019). AI-based educational systems can analyse large volumes of

learning data and provide personalized feedback tailored to students' learning needs. Through learning analytics and adaptive learning technologies, artificial intelligence enables the development of more flexible and individualized educational environments. These capabilities contribute to improving students' learning outcomes and support the development of higher-order cognitive skills such as critical thinking and problem-solving (Chen et al., 2020; Ouyang & Jiao, 2021). At the same time, the rapid diffusion of generative AI technologies has introduced new opportunities and challenges for higher education institutions. Tools based on large language models, such as AI-assisted writing systems and conversational agents, allow students to generate explanations, summaries, and ideas for academic tasks. These tools can support learning processes by facilitating information retrieval and helping students understand complex academic concepts. However, they also raise concerns regarding academic integrity, critical engagement with knowledge, and the ethical use of artificial intelligence in educational contexts (Kasneci et al., 2023; Dwivedi et al., 2023). Consequently, researchers increasingly emphasize the need to develop new competencies that enable students to interact effectively and responsibly with artificial intelligence technologies. One of the key competencies highlighted in recent literature is *AI literacy*, which refers to the knowledge, skills, and attitudes required to understand and critically evaluate artificial intelligence systems.

AI Literacy in Higher Education

The concept of AI literacy has emerged as an important area of research within the field of educational technology. AI literacy refers to the ability of individuals to understand the basic principles of artificial intelligence, interact with AI-based systems, and critically evaluate their implications for society and education (Long, Magerko, & Magerko, 2020). As artificial intelligence technologies become increasingly embedded in everyday life, developing AI literacy has become a crucial competence for students preparing to live and work in technology-driven environments. Ng et al. (2021) conceptualize AI

literacy as a multidimensional construct that includes several components, such as understanding fundamental AI concepts, applying AI tools in practical contexts, critically evaluating AI-generated outputs, and recognizing the ethical implications associated with artificial intelligence technologies. According to this perspective, AI literacy extends beyond technical knowledge and includes critical awareness and responsible use of AI systems. Recent studies highlight the importance of integrating AI literacy into higher education curricula. Developing students' competencies in understanding and using artificial intelligence can support more effective engagement with emerging technologies and help students develop critical perspectives on AI-generated information (Chiu et al., 2023).

Moreover, students with higher levels of AI literacy are more likely to use AI tools in ways that support learning and knowledge development rather than relying on them passively for automated content generation. In the context of higher education, AI literacy is closely connected to digital competence and technological readiness. Students who possess strong digital skills are better prepared to explore the capabilities of AI technologies and integrate them into their academic learning processes. Therefore, digital competence and experience with AI tools are often considered important predictors of AI literacy among university students (Ng et al., 2021; Chiu et al., 2023).

AI-Supported Scientific Knowledge Development

The integration of artificial intelligence into higher education has also raised important questions regarding its role in supporting the development of scientific knowledge among students. Scientific knowledge development in academic contexts typically involves processes such as exploring scholarly literature, understanding theoretical concepts, critically analysing information, and producing academic arguments. These processes are essential for the development of higher-order cognitive skills and for preparing students to engage in academic research. Recent research suggests that AI technologies can support several aspects of the knowledge

construction process. Through natural language processing and advanced information retrieval capabilities, AI systems can assist students in identifying relevant literature, summarizing academic texts, and generating explanations of complex concepts. These capabilities may facilitate students' engagement with academic knowledge and support deeper learning processes (Ouyang & Jiao, 2021, Crompton & Burke, 2023). In addition, AI-based tools can support students in analysing information and comparing different perspectives within scholarly literature. By providing instant feedback and generating alternative explanations, AI systems can encourage students to explore multiple interpretations of academic concepts and develop more nuanced understandings of complex topics. These features may contribute to the development of critical thinking and analytical reasoning skills (Ouyang & Jiao, 2021). Another important dimension of AI-supported learning relates to the production of academic knowledge. Students increasingly use AI tools to support tasks such as generating ideas for research projects, organizing arguments, and structuring academic writing. While these tools can facilitate the development of academic outputs, their effective use requires students to possess sufficient levels of AI literacy to critically evaluate and refine AI-generated content (Kasneci et al., 2023).

Despite the growing interest in AI in education, empirical research examining the relationship between AI literacy and scientific knowledge development remains limited. Most existing studies focus on technological adoption or students' attitudes toward AI technologies, while relatively few studies investigate how AI competencies influence students' engagement with academic knowledge. Understanding this relationship is particularly important in the context of higher education, where the development of scientific knowledge and research competencies represents a central objective of the educational process. Therefore, examining the role of AI literacy in supporting AI-assisted scientific knowledge development among university students represents an important direction for future research. Such investigations can provide valuable insights into how artificial intelligence can be integrated into educational practices in

ways that support deeper learning and the development of academic competencies.

Research Model and Hypotheses

Research Model

The conceptual model of this study examines the role of *AI literacy* in supporting the development of scientific knowledge among university students. The model is grounded in the literature on artificial intelligence in education, digital competence, and knowledge construction in higher education (Ouyang, 2021; Ng et al., 2021; Crompton & Burke, 2023).

In higher education, the development of scientific knowledge involves complex cognitive processes such as exploring academic literature, understanding theoretical concepts, analysing information critically, and producing scholarly arguments. Artificial intelligence tools have the potential to support these processes by facilitating information retrieval, generating explanations, and assisting students in organising academic ideas. However, the effectiveness of these tools depends largely on students' competencies in understanding and critically engaging with AI technologies. AI literacy represents a key competence that enables students to interact effectively with artificial intelligence systems. Students with higher levels of AI literacy are more likely to use AI tools critically and strategically in academic contexts, thereby enhancing their ability to explore and construct scientific knowledge.

Based on these considerations, this study proposes a conceptual model in which digital competence, experience with AI technologies, and attitudes toward AI influence AI literacy, which in turn contributes to the development of AI-supported scientific knowledge among university students.

Hypothesis Development

Digital competence and AI literacy

Digital competence represents an important prerequisite for the effective use of emerging technologies in educational contexts.

Students who possess strong digital skills are better equipped to explore technological tools, understand their functionalities, and integrate them into their learning processes. Previous research suggests that digital competence is closely related to the ability to understand and use artificial intelligence technologies in meaningful ways (Ng et al., 2021). Students with higher levels of digital competence are more likely to develop AI literacy because they possess the foundational skills required to interact with digital systems and evaluate technological outputs. Therefore, the following hypothesis is proposed:

H1: Digital competence positively influences AI literacy among university students.

Experience with AI technologies and AI literacy

Students' direct experience with artificial intelligence tools can also play an important role in the development of AI literacy. Through repeated interaction with AI systems, students may develop a better understanding of how these technologies operate and how they can be applied in academic contexts. Previous studies have shown that exposure to AI technologies contributes to increased technological awareness and improved understanding of AI systems (Chiu et al., 2023). As students gain experience using AI tools for tasks such as information retrieval, content generation, or academic writing support, they become more capable of evaluating the strengths and limitations of these technologies. Consequently, experience with AI technologies is expected to contribute positively to the development of AI literacy.

Thus, the following hypothesis is proposed:

H2: Experience with AI technologies positively influences AI literacy among university students.

Attitude toward AI and AI literacy

Students' attitudes toward artificial intelligence may also influence their willingness to engage with AI technologies in educational contexts. Positive attitudes toward AI may encourage students to explore the capabilities of these technologies and integrate

them into their learning processes. Conversely, negative perceptions or concerns about AI may limit students' engagement with these tools.

Research in educational technology suggests that attitudes toward emerging technologies play an important role in shaping technology adoption and usage behaviours (Crompton & Burke, 2023). Therefore, students who perceive AI as useful and beneficial for learning are more likely to develop competencies related to the effective use of these technologies.

Accordingly, the following hypothesis is formulated:

H3: Attitude toward artificial intelligence positively influences AI literacy among university students.

AI literacy and scientific knowledge development

AI literacy may also play a crucial role in supporting the development of scientific knowledge among students. Students who understand how AI technologies function and how to critically evaluate AI-generated outputs are better positioned to use these tools to support academic learning. AI tools can assist students in exploring scholarly literature, understanding complex theoretical concepts, analysing information, and generating academic ideas.

However, the effective use of these technologies requires students to possess sufficient levels of AI literacy to critically interpret AI-generated information and integrate it into their learning processes. Students with higher levels of AI literacy are therefore more likely to use AI tools in ways that enhance their engagement with academic knowledge and support deeper learning processes.

Based on these considerations, the following hypothesis is proposed:

Methodology

Research Design

This study employed a quantitative research design in order to investigate the role of AI literacy in supporting scientific knowledge development among university students in higher education. Quantitative approaches are frequently used in educational research to

examine relationships between psychological and behavioural constructs and to test theoretical models through statistical analysis. The study adopts a cross-sectional survey design, which allows the collection of data from a large number of participants within a relatively short period of time. This design is particularly suitable for analysing students' perceptions, competencies, and experiences related to the use of artificial intelligence technologies in academic contexts. The conceptual framework of the study examines the relationships between four main constructs: digital competence, experience with AI technologies, attitude toward AI, AI literacy, and AI-supported scientific knowledge development. Based on this framework, the study tests the proposed hypotheses in order to explore how AI literacy contributes to students' engagement with scientific knowledge development processes supported by artificial intelligence tools.

Participants

The participants in this study consisted of university students enrolled in higher education programs. Students from different academic disciplines were invited to participate in the study in order to obtain a diverse sample and capture a wide range of experiences related to the use of artificial intelligence technologies in academic learning. Participants were recruited using a voluntary sampling approach, and data were collected through an online questionnaire distributed via institutional communication channels and academic networks. Participation in the study was entirely voluntary, and respondents were informed about the purpose of the research prior to completing the questionnaire.

The sample included students from undergraduate and postgraduate programs who reported varying levels of experience with digital technologies and artificial intelligence tools used for academic purposes.

Research Instrument

Data were collected using a structured questionnaire designed to measure the constructs included in the research model. The questionnaire was developed based on existing literature on artificial intelligence in education, AI literacy, digital competence, and knowledge construction processes in higher education (Long, Magerko, & Magerko, 2020; Ng et al., 2021; Ouyang, 2021).

The instrument consisted of several sections corresponding to the main constructs of the study:

• digital competence
• experience with AI technologies
• attitude toward artificial intelligence
• AI literacy
• AI-supported scientific knowledge development

All items were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). This response format is widely used in educational research to capture respondents' perceptions and attitudes toward technological and pedagogical phenomena.The scale measuring AI-supported scientific knowledge development was designed to assess the extent to which artificial intelligence tools support students in exploring academic literature, understanding theoretical concepts, analysing information critically, and generating academic ideas. The scale includes items reflecting four dimensions of knowledge development: exploration of scientific literature, conceptual understanding, critical analysis of academic information, and academic knowledge production.

Data Collection Procedure

Data collection was conducted using an online survey platform. The questionnaire was distributed electronically to university students through academic communication channels and institutional mailing lists. Participants were informed about the objectives of the study and were assured that their responses would remain anonymous and confidential. Respondents were asked to

complete the questionnaire based on their experiences using artificial intelligence technologies in academic learning contexts.
The data collection process took place over a period of several weeks, allowing sufficient time for students to participate in the study.

Data Analysis

The collected data were analysed using statistical software packages commonly employed in educational research, such as SPSS. The analysis was conducted in several stages. First, descriptive statistics were calculated in order to summarize the characteristics of the sample and to examine the distribution of responses for each variable. Second, the reliability of the measurement scales was evaluated using Cronbach's alpha coefficients. Reliability analysis was conducted to assess the internal consistency of the constructs included in the questionnaire.

Third, factor analysis was performed to examine the validity of the measurement model and to confirm the dimensional structure of the constructs. Finally, the proposed hypotheses were tested using a series of regression analyses. Regression techniques were employed to examine the predictive relationships among digital competence, experience with AI, attitude toward AI, AI literacy, and AI-supported scientific knowledge development. This approach enabled the assessment of the relative contribution of each predictor variable to the proposed model.

Ethical Considerations

Ethical principles were carefully considered throughout the research process. Participation in the study was voluntary, and respondents were informed about the purpose and objectives of the research prior to completing the questionnaire.

All participants provided informed consent, and no personal identifying information was collected. The data were analysed in aggregated form to ensure the confidentiality and anonymity of the respondents. The study was conducted in accordance with ethical standards for research involving human participants and adhered to

institutional guidelines regarding data protection and research integrity.

4. Results and Discussion

4.1 Descriptive Statistics

The study involved a sample of 274 university students enrolled in undergraduate and postgraduate programmes from several academic disciplines. Descriptive statistics were calculated in order to examine the general tendencies of the variables included in the research model.

Table 1. Descriptive statistics of the study variables (N = 274)

Variable	Mean	SD	Min	Max
Digital competence	4.08	0.64	1	5
Experience with AI	3.72	0.71	1	5
Attitude toward AI	4.21	0.59	2	5
AI literacy	3.85	0.67	1	5
AI-supported scientific knowledge development	3.94	0.62	1	5

The results indicate that students generally reported relatively high levels of digital competence and positive attitudes toward artificial intelligence technologies. The mean score for AI literacy (M = 3.85) suggests that students possess moderate to relatively high competencies in understanding and interacting with artificial intelligence technologies. Similarly, the mean score for AI-supported scientific knowledge development (M = 3.94) indicates that students perceive AI tools as potentially useful for supporting academic knowledge exploration and development.

These results reflect the increasing presence of AI technologies in educational contexts and are consistent with recent studies suggesting that university students are becoming increasingly familiar with AI-based learning tools (Crompton & Burke, 2023).

4.2 Reliability Analysis

The internal consistency of the measurement scales was evaluated using Cronbach's alpha coefficients.

Table 2. Reliability analysis

Construct	Number of items	Cronbach's Alpha
Digital competence	5	0.88
Experience with AI	4	0.86
Attitude toward AI	4	0.90
AI literacy	6	0.89
AI-supported scientific knowledge development	6	0.91

All reliability coefficients exceeded the recommended threshold of 0.70, indicating a satisfactory level of internal consistency for all constructs. The highest reliability value was observed for the AI-supported scientific knowledge development scale ($\alpha = 0.91$), confirming that the items included in the instrument provide a consistent measurement of this construct.

4.3 Correlation Analysis

Pearson correlation analysis was conducted to examine the relationships between the study variables.

Table 3. Correlation matrix

Variable	*1*	*2*	*3*	*4*	*5*
1 Digital competence	1				
2 Experience with AI	.46**	1			
3 Attitude toward AI	.39**	.42**	1		
4 AI literacy	.54**	.57**	.49**	1	
5. AI-supported knowledge development	.48**	.52**	.44**	.63**	1

Note: $p < .01$

The results indicate significant positive correlations between all variables included in the research model. The strongest relationship

was observed between AI literacy and AI-supported scientific knowledge development ($r = .63$, $p < .01$). This finding suggests that students with higher levels of AI literacy are more likely to use artificial intelligence technologies to support academic knowledge exploration and development.

4.4 Predictors of AI Literacy

Multiple regression analysis was conducted to examine the influence of digital competence, experience with AI technologies, and attitudes toward AI on AI literacy.

Table 4. Model summary

R	R^2	Adjusted R^2	Std. Error
.72	.52	.51	.44

The regression model explained 52% of the variance in AI literacy, indicating substantial explanatory power.

Table 5. ANOVA results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	48.32	3	16.10	83.64	.000
Residual	44.12	270	.163		
Total	92.44	273			

The regression model was statistically significant:
$F(3,270) = 83.64$, $p < .001$

Table 6. Regression coefficients predicting AI literacy

Predictor	B	Beta	t	Sig.
Digital competence	.28	.29	5.62	.000
Experience with AI	.33	.34	6.11	.000
Attitude toward AI	.19	.21	3.19	.002

The results indicate that all predictors significantly influence AI literacy. Experience with AI technologies emerged as the strongest predictor ($\beta = .34$), followed by digital competence ($\beta = .29$) and attitudes toward AI ($\beta = .21$). These findings suggest that direct interaction with AI technologies plays a particularly important role in

the development of AI literacy competencies among university students.

4.5 AI Literacy and Scientific Knowledge Development

A second regression analysis examined the relationship between AI literacy and AI-supported scientific knowledge development.

Table 7. Model summary

R	R^2	Adjusted R^2
.63	.40	.39

The model indicates that AI literacy explains 40% of the variance in AI-supported scientific knowledge development.

Table 8. Regression coefficients

Predictor	Beta	t	Sig.
AI literacy	.58	12.84	.000

The results indicate that AI literacy significantly predicts AI-supported scientific knowledge development ($\beta = .58$, $p < .001$).

4.6 Discussion

The findings of the study provide empirical evidence supporting the proposed research model and highlight the important role of AI literacy in supporting scientific knowledge development among university students. First, the results confirm that digital competence significantly influences AI literacy. Students with higher levels of digital competence appear better prepared to understand and interact with artificial intelligence technologies. This finding supports previous research suggesting that digital competence represents a key prerequisite for engaging effectively with advanced digital technologies and developing AI-related competencies (Ng et al., 2021). Second, the findings demonstrate that experience with AI technologies is the strongest predictor of AI literacy. Students who frequently interact with AI tools tend to develop a deeper understanding of their capabilities and limitations. This finding is consistent with previous studies highlighting that direct technological

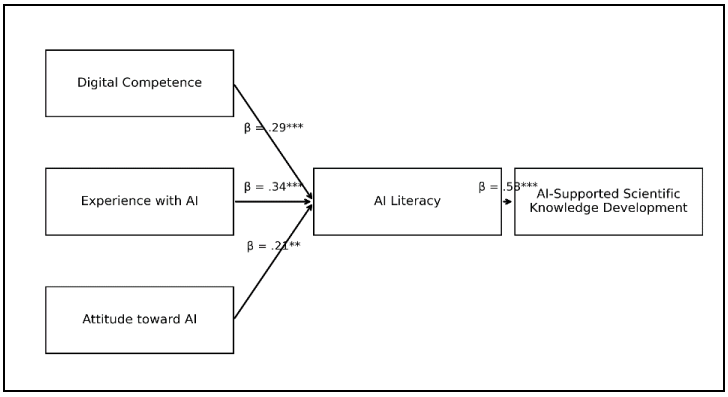
exposure contributes significantly to the development of digital competencies and technological awareness (Chiu et al., 2023).

Third, the results indicate that students' attitudes toward artificial intelligence influence AI literacy development. Positive perceptions of AI technologies encourage students to explore these tools and integrate them into their academic activities. This finding aligns with research on technology adoption which emphasizes the role of attitudes in shaping technology use behaviours (Crompton & Burke, 2023).

Finally, the study demonstrates a strong relationship between AI literacy and AI-supported scientific knowledge development. Students who possess higher levels of AI literacy are more capable of using AI technologies to explore scientific literature, analyse academic information, understand complex theoretical concepts, and generate scholarly ideas.

These findings suggest that AI literacy functions as a key enabling competence that allows students to transform artificial intelligence technologies into meaningful tools for academic learning and knowledge construction. Overall, the results highlight that the educational impact of artificial intelligence depends not only on the availability of technological tools but also on students' competencies in understanding and critically engaging with these technologies.

Figure 1. Proposed Research Model



Conclusions

The present study examined the role of AI literacy in supporting AI-assisted scientific knowledge development among university students in higher education. The findings provide empirical evidence regarding the importance of students' competencies in interacting with artificial intelligence technologies for supporting academic learning processes. The results demonstrate that digital competence, experience with artificial intelligence technologies, and attitudes toward AI significantly influence students' AI literacy, while AI literacy itself plays a substantial role in facilitating AI-supported scientific knowledge development. These findings highlight that students' ability to effectively use artificial intelligence tools for academic purposes depends not only on access to technological resources but also on the competencies required to understand, evaluate, and critically engage with AI-generated information. The results of this study are consistent with previous research emphasizing the growing importance of AI literacy as a key competence in contemporary educational environments. Long, Magerko, and Magerko (2020) argue that AI literacy represents a fundamental capability that enables individuals to understand and critically evaluate AI technologies and their implications. Similarly, Ng et al. (2021) emphasize that AI literacy includes not only technical knowledge about artificial intelligence but also the ability to critically interpret AI-generated outputs and to use these technologies responsibly. The findings also support previous studies highlighting the role of digital competence as a foundational factor in the development of AI-related competencies. Research conducted by Chiu et al. (2023) indicates that students with higher levels of digital competence are more capable of understanding and interacting with emerging technologies, including artificial intelligence systems. In the present study, digital competence significantly predicted AI literacy, suggesting that strong digital skills provide an essential basis for the development of competencies related to AI technologies. Furthermore, the results align with previous research demonstrating that direct interaction with AI technologies contributes significantly to the

development of technological competencies. Exposure to AI-based tools allows students to become familiar with their capabilities and limitations, facilitating deeper understanding and more effective use of these technologies in academic contexts (Crompton & Burke, 2023). One of the most important contributions of this study concerns the relationship between AI literacy and scientific knowledge development. The findings suggest that students who possess higher levels of AI literacy are more capable of using artificial intelligence tools to support processes related to academic knowledge construction. These results support previous research suggesting that artificial intelligence technologies have the potential to support higher-order learning processes, including knowledge exploration, conceptual understanding, and critical analysis of information (Ouyang, 2021; Zawacki-Richter et al., 2019). Moreover, the findings extend existing research by demonstrating that the educational value of artificial intelligence depends not only on the technological capabilities of AI systems but also on students' competencies in engaging critically with these technologies. While previous studies have largely focused on the technological applications of AI in education, the present study emphasizes the importance of AI literacy as a mediating competence that enables students to transform AI technologies into meaningful tools for academic knowledge development. Overall, the results of this study highlight the need for higher education institutions to support the development of AI literacy among students. As artificial intelligence technologies become increasingly integrated into academic environments, universities should ensure that students develop the competencies required to use these technologies effectively, critically, and responsibly. Integrating AI literacy into higher education curricula may therefore represent an important step toward preparing students for future academic and professional contexts shaped by artificial intelligence technologies. Finally, this study contributes to the growing body of research on artificial intelligence in education by providing empirical evidence regarding the relationship between AI literacy and scientific knowledge development in higher education. Future research could further explore how pedagogical strategies, institutional support, and

disciplinary differences influence students' ability to use artificial intelligence tools to support academic knowledge construction.

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