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Teachers' Readiness to Integrate Artificial Intelligence into Higher Education and Their Digital Competence (A Case Study of Genetics Education)

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Abstract: This article presents the theoretical and methodological foundations of a study aimed at examining the relationship between the digital competence of faculty members in higher education institutions and their readiness to integrate artificial intelligence (AI) into the educational process. The study employs a quantitative cross-sectional design. Data are collected through a structured questionnaire based on a five-point Likert scale and analyzed using descriptive statistics, reliability analysis (Cronbach's alpha), correlation analysis, the t-test, analysis of variance (ANOVA), and multiple regression analysis. The article provides a detailed rationale for the scientific relevance of the study, its objectives, research questions, selected methodology, and planned analytical framework. The findings are expected to contribute to the development of a human-centered and responsible model for the use of artificial intelligence in higher education.

Keywords: digital competence, artificial intelligence, teacher, higher education, AI readiness, digital education, AI integration, pedagogical competence

1. Introduction

The rapid development of digital technologies is substantially transforming the content and methods of teaching and learning in higher education [1]. In particular, the widespread adoption of generative artificial intelligence (AI) technologies is opening new opportunities for teachers to create instructional materials, conduct assessment, organise individualised learning, and enhance communication with students [2].

However, the mere availability of technology does not automatically ensure its effective pedagogical application [3]. A teacher's digital competence, attitude toward technology, knowledge of AI, and readiness to adopt new technologies are important factors in AI integration [4]. Consequently, alongside the general question of "how does AI affect education?", the questions "how ready are teachers to integrate AI into teaching?" and "how does their digital competence affect this readiness?" are also acquiring significant scientific importance today.

The framework developed by UNESCO on AI competency for teachers [5] defines 15 competencies across five areas — human-centred mindset, AI ethics, AI foundations and applications, AI pedagogy, and professional development — formed across three progression levels (acquire, deepen, create). In addition, the DigCompEdu framework developed by the European Commission [6] makes it possible to assess educators' digital competence across several dimensions.

Nevertheless, empirically studying the relationship between teachers' overall digital competence and their readiness to integrate generative AI into teaching remains relevant,

particularly in the context of developing education systems [7]. The present study is aimed at partially filling this scientific gap.

The primary aim of the study is to determine the statistical relationship between the digital competence of higher education faculty members and their readiness to integrate artificial intelligence into the educational process. In addition, the study examines teachers' level of digital competence, their level of AI integration readiness, their attitude toward the responsible use of AI, their experience of using AI, and their experience of AI-related professional development [8].

Research questions:

1. What is the level of digital competence of higher education faculty members?
2. What is the level of higher education faculty members' readiness to integrate AI into the educational process?
3. Is there a statistically significant relationship between higher education faculty members' digital competence and their AI integration readiness?
4. To what extent do digital competence, AI usage experience, and AI-related training predict teachers' AI integration readiness?
5. Is there a difference in the level of AI integration readiness among different demographic groups?

2. Materials and Methods

The study employs a quantitative cross-sectional design [9], meaning that respondents' data are collected at a specific point in time through a one-off questionnaire. This design makes it possible to identify the statistical relationships among variables within a relatively short period and on a large-sized sample.

2.1 Data collection instrument and procedure.

Data are collected through a structured questionnaire based on a five-point Likert scale. The questionnaire assesses indicators of digital competence, AI integration readiness, responsible use of AI, AI usage experience, and experience of AI-related professional development. The questionnaire is distributed via the Google Forms platform; respondents are informed of the purpose of the study, and the anonymity of the data is ensured. The estimated time for completing the questionnaire is 7–10 minutes.

2.2 Data analysis methods.

In processing the collected data, descriptive statistics, reliability analysis, Pearson correlation analysis, independent-samples t-tests, one-way ANOVA, and multiple regression analysis are used [10]. The main purpose and an illustrative application of each method are summarised in Table 1.

Table 1. Statistical analysis methods used in the study

Analytical procedure	Main purpose	Illustrative application
Descriptive statistics	Summarising the collected data (M, Median, SD, Min/Max, frequency)	What is the average level of teachers' digital competence?
Cronbach's alpha	Assessing the internal consistency (reliability) of the questionnaire scale	Are the questionnaire items consistent with one another?
Pearson correlation	Determining the linear relationship between two quantitative variables	Are digital competence and AI readiness related?

Analytical procedure	Main purpose	Illustrative application
Independent-samples t-test	Comparing the mean values of two independent groups	Do male and female teachers differ?
One-way ANOVA	Comparing the mean values of three or more independent groups	Do groups with different lengths of service differ?
Multiple regression	Assessing the joint effect of several independent variables on a dependent variable	To what extent do digital competence, experience, and training predict AI readiness?

Each research question is examined through a specific statistical analysis method; this correspondence is reflected in Table 2.

Table 2. Research questions and their corresponding analytical procedures

Research question	Corresponding analytical procedure
1. What is the level of faculty members' digital competence?	Descriptive statistics (M, SD)
2. What is the level of faculty members' readiness to integrate AI?	Descriptive statistics (M, SD)
3. Is there a statistically significant relationship between digital competence and AI integration readiness?	Pearson correlation
4. To what extent do digital competence, AI usage experience, and training predict AI integration readiness?	Multiple regression analysis
5. Do different demographic groups differ in their level of AI integration readiness?	Independent-samples t-test / one-way ANOVA

3. Results

This article presents the theoretical and methodological foundations of the study and its analytical design; since the data collection stage has not yet been completed, specific quantitative results are not presented within this article — they will be published in a separate empirical article once the data have been fully collected. Nevertheless, in accordance with the analytical plan described above, results are anticipated for the following indicators:

1. Based on descriptive statistics, the mean levels (M, SD) of teachers' digital competence and AI readiness will be determined;
2. The internal consistency of the scale used will be examined through the Cronbach's alpha coefficient ($\alpha \geq 0.70$ will be accepted as the threshold for acceptable reliability) [11];
3. Pearson correlation will be used to determine the direction and strength of the relationship (the r value and its level of statistical significance) between digital competence and AI readiness;

4. Multiple regression analysis will assess the extent (R^2 value) to which digital competence, AI usage experience, and training explain the variation in teachers' AI readiness [12];
5. T-test and ANOVA results will identify differences in AI readiness levels across demographic factors such as gender, length of service, and field of specialisation.

4. Discussion

The anticipated results of the study will be interpreted in harmony with the principles emphasised in the UNESCO AI competency and DigCompEdu frameworks. Should a statistically significant positive relationship between digital competence and AI readiness be identified, this would theoretically confirm that systematic training aimed at developing digital competence can accelerate AI integration [13]. At the same time, because correlational analysis does not prove a causal relationship, the identified associations should be interpreted only at the level of association.

The scientific value of the study lies not so much in AI technology itself as in placing at its centre the teacher's readiness to pedagogically accept and use the technology responsibly. This approach shifts the concept of AI Readiness from the simple question "can we use AI?" to the deeper question "can we use AI correctly and sustainably?" — in which the quality and organisation of data, staff members' level of AI knowledge, a clear AI strategy, and the existence of security and ethical rules are of decisive importance.

4.1 Practical recommendations.

Based on the results of the study, the following practical recommendations can be developed for higher education institutions: (1) organising dedicated AI literacy training for teachers; (2) conducting practical workshops on the use of AI [14]; (3) introducing training courses on checking AI-generated content and on academic integrity; (4) expanding continuous programmes for developing teachers' overall digital competence [15]; (5) developing and adopting an institution-level Responsible AI Policy.

4.2 Limitations of the study.

The cross-sectional design employed reflects the situation only at a single point in time and does not allow causal relationships between variables to be established. In addition, the self-report questionnaire method may be affected by social desirability bias [16]. It is recommended that future research make use of longitudinal designs, as well as be enriched with qualitative methods such as interviews or observation.

5. Conclusion

This article has substantiated the scientific relevance, aim, research questions, and IMRAD-consistent methodology of a study aimed at empirically examining the relationship between higher education faculty members' digital competence and their readiness to integrate artificial intelligence into the educational process. The main scientific value of the study lies not so much in AI technology itself as in placing at its centre the teacher's readiness to pedagogically accept and use the technology responsibly. Once the data have been collected, the results of the study will serve to shape a human-centred, pedagogical, and responsible model of AI integration in higher education.

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