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WEIGHING THE PROS AND CONS OF ARTIFICIAL INTELLIGENCE (AI) IN HIGHER EDUCATION: A MIXED-METHODS SURVEY OF BULGARIAN UNIVERSITY INSTRUCTORS

(Research article)

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Abstract

The present study aimed to identify prevailing sentiments among the Bulgarian academic community toward AI tools and establish a benchmark for the integration of AI into education. A mixed-methods survey was completed by 910 university instructors from higher education institutions in Bulgaria. The data was analyzed through statistical and content analyses. The participants showed awareness of the inevitable changes that AI would bring to the existing educational paradigm. Although they seemed quite familiar with the most popular AI tools, they acknowledged deficiencies in their preparedness and emphasized the need for training to utilize AI affordances effectively. The educators outlined the risks associated with unethical use of AI and underscored the urgent establishment of norms and guidelines. The lack of scientific data on the long-term effects of AI on students' cognitive abilities and creative thinking emerged as a dominant concern and reason for skepticism. The instructors viewed personalized education as a positive asset of AI, aligning with diverse learner profiles, but they also considered it a threat, devaluing the role of educators and classroom dynamics. Familiarity with AI, subject area, and gender accounted for 92.83% of the variability in the instructors' opinions on the utility of AI. Alongside developing educators' expertise in AI technology, it is essential to delineate the scope, objectives, and domains of AI use.

***Keywords**:* Artificial intelligence, benefits, challenges, familiarity, higher education instructors

1. Introduction

The current study is positioned within the context of the Technology Acceptance Model (TAM), which was established by Davis in 1989. This model seeks to elucidate the factors that contribute to users' acceptance and utilization of new technologies. Underlying the model are two concepts, that of perceived usefulness (PU) and perceived ease of use (PEOU). The first concept pertains to the extent to which an individual perceives that the utilization of a specific technology will improve their job performance or daily activities. Individuals are more inclined to adopt a technology when they perceive it as useful. The second concept refers to the extent to which an individual perceives that utilizing a technology will require minimal effort. The model acknowledges that PU and PEOU are influenced by a number of factors, among which are the user's competence, training, and experience, as well as the specific characteristics of the technology itself (Davis, 1989).

Thirty-six years later, in the era of advanced information systems, TAM has become a key foundation for research on technological innovations in education, which are often received with mixed feelings of enthusiasm and skepticism. It takes time for educators to accept and implement them on a wide scale (Borisov & Stoyanova, 2024; Fuentealba & Imbarack, 2014). The adoption of new technologies largely depends on instructors' confidence in their usefulness and positive impact (Al-Furaih & Al-Awidi, 2020; Ayanwale et al., 2022; Darmansyah et al., 2020; Nikolopoulou, 2021). Therefore, educators need a solid knowledge

base and the necessary skills to critically assess emerging educational developments (Yue et al., 2024). A lack of preparation can lead to uncertainty, frustration, and even resistance to adopting new innovations (Nikolaevna, 2019; Mayorga & Pascual, 2019). Additionally, hands-on experience with new tools is essential for building teachers' confidence in their utility (Kim & Kim, 2022).

Generative artificial intelligence (GAI) is a recent innovation that has agitated the educational community by its promises and potential drawbacks (Chounta et al., 2021; Nazaretsky et al., 2021). The controversy surrounding the implementation of AI in education has intensified due to the recent proliferation of numerous GAI tools that can perform tasks unique to humans, such as gathering and synthesizing information, designing programs and presentations, verbalizing text, and deriving videos from text, among others (Kaplan-Rakovski et al., 2023).

The growing discussions and attempts to integrate AI technology into the educational process have sparked a heated debate. A search on Google Scholar for publications on educators' attitudes to AI yields a number of titles that have both positive and negative connotations, illustrated by the following examples: 'promises and perils' (Murugesan & Cherukuri, 2023), 'promises and challenges' (Celik et al., 2022), 'possibilities and challenges' (Rabiatu, 2024), 'possibilities and apprehensions' (Alam, 2021), 'affordances and challenges' (Crompton et al., 2022), 'promise and pitfalls' (Qadir, 2022).

Recent research on educators' opinions on AI-powered tools indicates that their attitudes are multilayered, encompassing enthusiasm, promise, and interest with caution, skepticism, and frustrations (Chounta et al., 2021; Kaplan-Rakovski et al., 2023; Nazaretsky et al., 2021; Terzi, 2020; Zanetti et al., 2019). However, the majority of studies focused on K-12 educators, while fewer studies examined the opinions and inclinations of university instructors toward AI. While instructors in higher education institutions enjoy greater academic freedom in designing courses and syllabuses, as well as choosing methodologies and technologies, they also face challenges posed by the advancement in AI tools like their K-12 counterparts (Kiryakova & Angelova, 2023; Pisica et al., 2023).

The rapid release of updated or completely new AI-powered tools adds another challenge to educators' confusion and dilemmas regarding the choice of tools, the extent to which they should be used, the possible drawbacks and outcomes, etc. (Kaplan-Rakovski et al., 2023; Kurshumova, 2024). This study sought to investigate the perspectives of university instructors in Bulgaria regarding the effectiveness of AI tools for higher education, in the context of a burgeoning public and media discussion on the subject, while the development of formal guidelines and policies was ongoing. The main objective was to ascertain prevailing opinions among the Bulgarian academic community about AI tools and establish a benchmark for their integration into education.

2. Literature Review

2.1 Research on Artificial Intelligence in Higher Education

In response to the growing popularity and accessibility of AI technologies, scholarly publications examining the role of artificial intelligence in higher education have proliferated since 2020, encompassing educational contexts worldwide (Crompton & Burke, 2023). The number of systematic reviews on the topic is also on the increase. The conclusions drawn by the authors of two such reviews indicate that although the publications spanned different fields, engineering and sciences were the most frequent (Chu et al., 2022; Zawacki-Richter, et al., 2019).

A more recent systematic review of 138 related articles shows that 17% of the publications focused on instructors versus 72% on students and 11% on administration (Crompton & Burke, 2023). In contrast, a related review of K-12 publications revealed that teachers were the primary subject of research interest (Crompton et al., 2022). The aforementioned systematic reviews have delineated three principal applications of AI in higher education to date (Chu et al., 2022; Crompton & Burke, 2023; Zawacki-Richter et al., 2019): 1) Administrative functions: enrollment and admissions, profiling and forecasting educational outcomes, monitoring student performance and attrition rates, among other uses; 2) Assessment and evaluation: grading, tracking student progress, providing feedback, etc.; 3) Instructional support: developing course materials, syllabi, personalized projects, and individualized educational opportunities, among others.

Another subset of studies on AI in education, including higher education, offers SWOT (strengths, weaknesses, opportunities, and threats) assessments of its hypothetical applications and possible outcomes (Baidoo-Anu & Ansah, 2023; Bozkurt et al., 2023; Farrokhnia et al., 2024; Grassini, 2023). The most frequently cited advantages encompass opportunities for a personalized approach to teaching and learning, which is grounded in the individual needs, interests, and capabilities of students (Bozkurt et al., 2023; Latifi, 2021); the facilitation of grading, assessment, and the provision of timely feedback regarding student performance (Farrokhnia et al., 2024; Mizumoto & Eguchi, 2023); and a reduced workload for educators through support in various routine tasks, including course and syllabus design, as well as the creation and evaluation of tests, projects, and assignments (Farrokhnia et al., 2024; Qadir, 2022). On the other hand, the most frequently addressed deficiencies pertain to potential unethical practices, such as plagiarism and cheating (Dowling & Lucey, 2023; Farrokhnia et al., 2024; Susnjak, 2022); adverse effects on cognitive development, creativity, and critical thinking (Bozkurt et al., 2023; Farrokhnia et al., 2024; Kasneci et al., 2023); a negative impact on classroom dynamics and interactions (Bozkurt et al., 2023); and biased, inappropriate, and untruthful information (Kasneci, 2023; Tlili et al., 2023).

Amidst recent publications regarding AI and higher education, studies addressing the opinions, attitudes, and practices of higher education instructors constitute a relatively small corpus. The next section outlines predominant perspectives on AI reported in recent studies within the higher education community.

2.2. Opinions of Higher Education Instructors on the Utility of AI

Extrapolating from recent scientific reports, higher education instructors recognize that in line with societal progress and modernization, the incorporation of AI technologies into educational practices is inevitable. Its implementation is important for meeting the needs of current and future learners (Borisov & Stoyanova, 2024). This awareness is accompanied by mixed sentiments on the efficacy of AI tools and their long-term implications for the value of learning, critical and creative thinking, and academic integrity, among other factors (Iqbal et al., 2022; Kiryakova & Angelova, 2023).

In a qualitative study with 20 university instructors in Pakistan, Iqbal et al. (2022) observed mixed sentiments towards ChatGPT. Although the instructors indicated its usefulness for lesson planning and student assessment, the dominant theme was one of skepticism and concerns about violations of academic ethics and integrity. On the other hand, two studies involving instructors at Bulgarian universities reported more positive attitudes toward AI (Borisov & Stoyanova, 2024; Kiryakova & Angelova, 2023). In a survey with 87 professors at a Bulgarian higher education institution, Kiryakova and Angelova (2023) observed that most participants were familiar with AI tools and were positively inclined toward using ChatGPT for instructional purposes. The educators identified several benefits of utilizing ChatGPT,

including heightened learner interest and motivation, resulting in enhanced engagement; stimulation of deep cognitive processing, encompassing critical and creative thinking; and support in the preparation of teaching and assessment materials, among others. The instructors' primary concerns revolved around the reliability of the information provided by ChatGPT, the risk of cheating and plagiarism, and the objectivity of assessment. (Kiryakova & Angelova, 2023).

The second study involved a mixed sample of 255 university professors, doctoral students, and students at another Bulgarian higher education institution. The survey asked the participants to rank the potential drawbacks, assets, and problems of using AI on a scale of 1 to 10. The educators alone, excluding the students, saw several possibilities for the implementation of AI tools in the educational process, including: evaluation of learning outcomes and their potential improvement; assistance in generating ideas for student projects; and personalized feedback regarding student performance on different assessment tasks. The primary risks associated with the use of AI tools include the reliability of AI-obtained information, its adverse effects on face-to-face communication and classroom interactions, cyber security concerns, and the potential for malicious actions. The educators were also concerned about the potential decline in cognitive functions and critical and problem-solving abilities (Borisov & Stoyanova, 2024).

Another recent study investigated the opinions of Romanian higher education instructors about the utility of AI for academic purposes (Pisica et al., 2023). The data was derived from interviews with 18 instructors from five universities in the social sciences and humanities. In favor of AI, the instructors acknowledged its potential to modernize the educational processes and promote new competencies and qualities. They saw opportunities for personalized teaching, flexible methodology, and learner-tailored curriculum. At the same time, the instructors were concerned about negative impacts on the value of classroom interaction, ethical violations, diminishing the role of educators, and potentially leading to job loss (Pisica et al., 2023).

In summary, the perspectives of university instructors on AI's impact on higher education (Borisov & Stoyanova, 2024; Kiryakova & Angelova, 2023; Pisica et al., 2023) aligned with the hypothetical projections discussed in more theoretical research (Baidoo-Anu & Ansah, 2023; Bozkurt et al., 2023; Farrokhnia et al., 2024; Grassini, 2023). The positive and negative aspects indicated by the instructors corroborated the projected benefits and drawbacks of AI.

The current study examined the opinions of Bulgarian university instructors on the utility of AI technology for educational purposes. The research questions were as follows:

1) How do Bulgarian university instructors assess their level of familiarity with AI technology? (Quantitative)
2) Which AI tools are the instructors familiar with? (qualitative)
3) What are instructors' opinions on the utility of AI technology for educational purposes? (Quantitative and Qualitative)
4) Do instructors' opinions on AI technology vary among subject areas and years of teaching experience? (Quantitative)
5) Which factors influence instructors' opinions on the utility of AI as an educational tool? (Quantitative)
6) What do instructors perceive as the greatest challenges in the implementation of AI tools into education? (Qualitative)

3. Methodology

3.1 Background

Similar to the global community, the educational system in Bulgaria is currently experiencing the rapid advancement of AI and the imminent need for guidelines, methodological and technical support, and teacher preparation. In February 2024, the Bulgarian Ministry of Education and Science took the first step in this direction by issuing an instructional manual that addressed both theoretical and practical aspects of AI use (Ministry of Education and Science, 2024, Guidelines). The prevailing sentiments among educators at this threshold moment were both of excitement and frustration with the unknown.

3.2 Research Purpose and Design

The present study was conducted in the spring semester of 2024, amidst growing public and media discourse on the utility of AI in education while formal guidelines and policies were still under development. It aimed to identify prevailing sentiments among the Bulgarian academic community towards AI tools and establish a benchmark for their integration into education. The research design falls into the framework of exploratory mixed-methods surveys, including both quantitative and qualitative questions. The committee of scientific ethics in the faculty of mathematics and informatics at Plovdiv University "Paisii Hilendarski" reviewed and approved the study under protocol №1252 of January 31, 2024. The survey was administered to university instructors from all major Bulgarian universities through email. The questionnaire was created on Google Sheets. Before responding to the survey questions, the participants received and approved electronically an informed consent for the use of the data in research publications. They were assured about the voluntary nature of the survey and the anonymity of their responses. The survey included four demographic questions, 10 quantitative questions, and four qualitative questions. The quantitative questions were coded on a Likert scale with 5 levels (1 = strongly disagree and 5 = strongly agree; or 1 = very and 5 = not at all). Cronbach's alpha on the Likert scale items (n = 10) showed a good internal consistency of $\alpha = 0.927$ (standardized alpha = 0.928; lower 95% CI limit = 0.91).

3.3. Participants

The survey was completed by 910 university instructors from higher education institutions located in 20 different Bulgarian cities (Sofia, Plovdiv, Varna, Burgas, Blagoevgrad, Veliko Turnovo, Svishtov, Gabrovo, Kurdzhali, Smolyan, Pleven, Russe, Shumen, among others). The women constituted the larger proportion of the participants (62.50%). The majority of the respondents were aged between 30 and 59, with the age group 40 to 49 constituting the largest percentage. The highest percentages of educators worked at universities in the capital city of Sofia (n = 311; 34.20%) and the second largest Bulgarian city of Plovdiv (n = 240; 26.40%). The participants were almost evenly distributed according to their teaching experience. The instructors represented five major specialty areas, with mathematics, sciences, and technology accounting for 33.50% and humanities for 33.30% (Table 1).

Table 1: Background information about the participants in the survey

Variables	Frequency (n)	Percentage
Gender		
Men	341	37.50%
Women	569	62.50%
Age		
20 - 29 years	31	3.40%
30-39 years	180	19.40%
40-49 years	351	38.60%
50-59 years	232	25.50%
≥ 60 years	116	12.70%
Teaching experience		
1-5 years	136	14.90%
6 -10 years	142	15.60%
11-15 years	151	16.60%
16-20 years	144	15.80%
21-25 years	142	15.60%
26 -30 years	96	10.50%
> 30 years	99	10.90%
Subject area		
Mathematics, sciences & technology	305	33.50%
Humanities	303	33.30%
Social sciences	184	20.20%
Medical sciences	77	8.50%
Arts & music	41	5.50%

3.4. Data Analysis

3.4.1 Statistical analysis

The statistical software for the Social Sciences (SPSS) Version 27 (2020) was used to analyze the data. The Likert scale items were treated as continuous variables, and their distributions were checked for normality through Kolmogorov-Smirnov's test. The central tendency was described with the means and standard deviations (SD) for normally distributed variables. Categorical variables were summarized by frequencies and percentages, and associations were established through the Chi-square test and z-test comparisons of paired proportions.

The general linear model (GLM) was used to examine if the participants' opinions on the utility of AI differ among the different subject areas and in relation to their age and/or teaching experience. Each independent variable was tested while the other one was statistically controlled for confounding effects. Thus the central tendency was represented by the estimated marginal means (EM means) which are calculated when the effect of the covariate is removed. The Bonferroni multiple comparison test was employed to perform pair-wise comparisons when GLM showed significant main effects. Multivariate linear regression analysis was performed to identify factors that significantly affect instructors' opinions on the utility of AI. The predictors were screened for multicollinearity and were included in the regression analysis if the variable inflation factor (VIF) was less than five (Akinwande et al., 2015). The backward elimination method was used to remove factors that did not show significant association with the dependent variable. All statistical tests were two-tailed and performed at a Type I error (α) of 0.05.

3.4.2 Content analysis

The narrative data was translated from the Bulgarian original into English. Content analysis was performed to identify common themes, which were coded and organized into categories. Key words, phrases, and full statements were identified for illustration of the main themes. The categories were tabulated and represented as numbers and percentages of participants who contributed to certain themes. Key terms and phrases were employed to describe each theme. Comments were quoted in their entirety when appropriate.

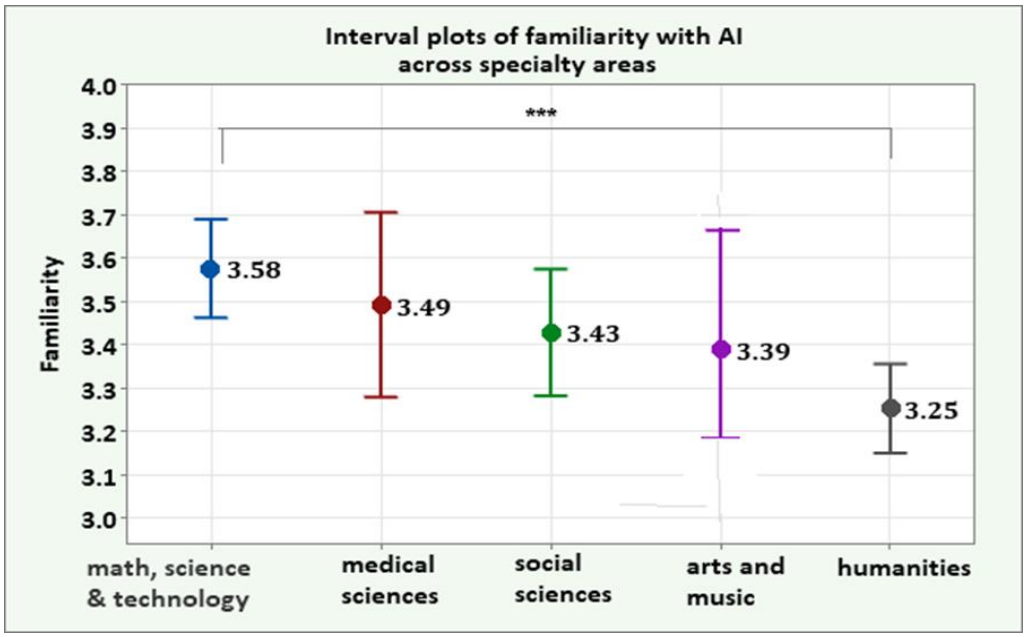
4. Results

4.1 Familiarity with AI Tools

The instructors rated their level of familiarity with AI technology on a 5-point scale (5 = very familiar, 4 = familiar, 3 = somewhat familiar, 2 = vaguely familiar, and 1 = unfamiliar). The data was treated as continuous for the purpose of the statistical analysis. The descriptive statistics for the entire cohort of 910 participants indicated a mean of 3.42 (SD = 0.98).

According to the 5-point Likert scale, the central tendency fell between *somewhat familiar* and *familiar*. This result coincides with the tabulation into levels of familiarity, showing that 41.10% (n = 374) of the instructors indicated being *somewhat familiar*, and 27.10% (n = 247) were *familiar* with AI technology. Notably, only 1.30% (n = 12) of the instructors reported being *unfamiliar* with AI technology.

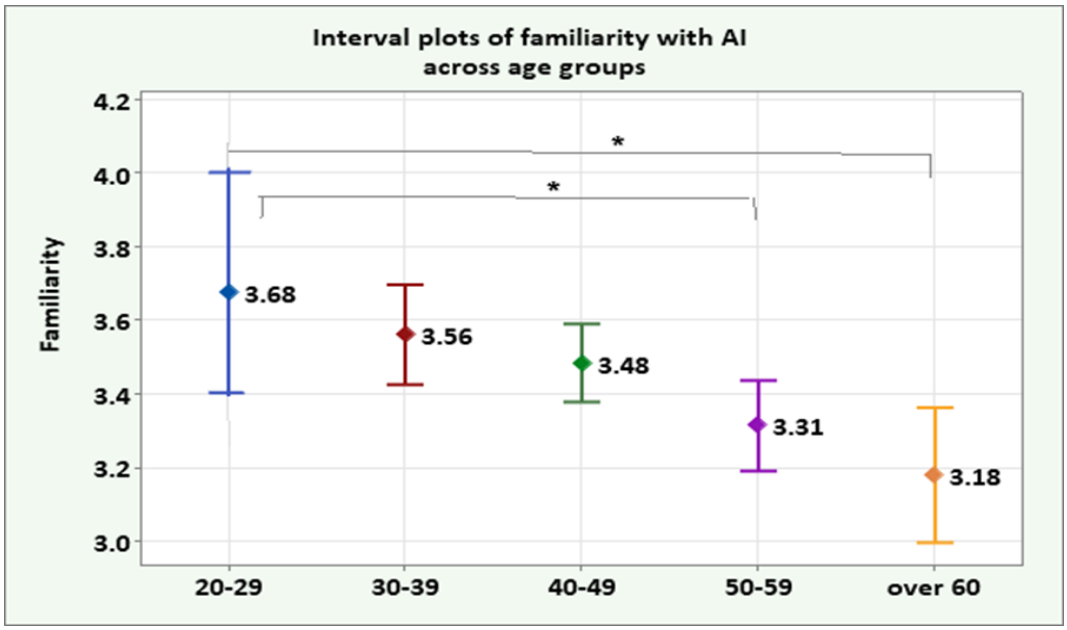
The GLM analysis identified specialty areas as being significantly associated with the level of familiarity when participants' age was entered as a covariate ($F = 4.547$; df: 4, 904; $p = 0.001$). Figure 1 shows the EM means for specialty areas, from highest to lowest. The math, science and technology instructors reported the highest level of familiarity (mean = 3.54, SD = 0.98), followed by those in the medical sciences (mean = 3.49, SD = 0.94), social science (mean = 3.43, SD = 0.99), arts and music (mean = 3.39, SD = 0.97), and the humanities (mean = 3.25, SD = 0.91). However, only the math, science, and technology instructors and those in the humanities showed a significant difference in familiarity with AI ($p < 0.001$).



*** - Significant difference at $p < 0.001$

Figure 1: Familiarity with AI across specialty areas

The GLM revealed a strong correlation between age groups and AI familiarity when the variable specialty area was added as a covariate (F = 4.21; df 4, 904; p = 0.002). In Figure 2, the level of familiarity decreases as the age increases, indicating a negative association. The instructors of the youngest age group (20-29) reported a higher level of familiarity with AI (mean 3.68; SD = 0.992), followed by those of the following age groups: 30 to 39 (mean 3.56; SD = 0.916), 40 to 49 (mean 3.48; SD = 0.935), 50 to 59 (mean 3.31; SD = 0.948), and over 60 (mean 3.18; SD = 0.968). Significant differences were found between the youngest age group (20 to 29 years) and the older age groups 50 to 59 (p = 0.045) and over 60 (p = 0.018).



* - Significant difference at p < 0.05

Figure 2: Familiarity with AI across age groups

The participants were asked to provide the names of the AI applications that they were familiar with. The data was tabulated and presented as numbers and percentages. The majority of the participants entered more than one AI application, the numbers ranging from 2 to 7. This explains why the percentages exceed 100%. Table 2 reveals that ChatGPT was the most popular AI app among the participants, appearing in 95.50% of the responses. Gemini, which was previously known as Google Bard, was indicated by 43.40% of the instructors. Copilot was familiar to 37.50% and Perplexity to 16.50%. All four most frequently mentioned apps are AI-powered chatbots that can respond to and solve textual queries, which are referred to as prompts (Baidoo-Anu & Ansah, 2023).

The participants were less familiar with AI applications that can produce digital images from text descriptions. Examples of such applications include DALL-E, Midjourney, and Bing Image Creator. The least familiar were AI-powered apps that can function as text-to-audio generators (e.g., Play HT) or as text-to-video generators (e.g., Synthesia) (Ministry of Education and Science, 2024, p. 11, Guidelines).

Table 2: AI tools that the instructors reported as being familiar with

AI apps	Frequency (n)	Percentage
ChatGPT	865	95.50%
Gemini (Google Bard)	395	43.40%
Copilot	342	37.50%
Perplexity	150	16.50%
Bing image creator	145	15.90%
DALLE	129	14.20%
Midjourney	125	13.70%
Synthesia	124	13.60%
Play HT	45	4.90%
Jasper AI	42	4.60%
Claude	39	4.20%
None	12	1.30%

4.2. Instructors' Opinions on the Utility of AI Technology for Educational Purposes

The instructors' opinions on the utility of AI technology for educational purposes were examined through quantitative and qualitative data. The quantitative data was measured on an ordinal scale, where five indicated completely agree and one indicated completely disagree. For the statistical comparisons, the data were treated as continuous variables. In the GLM model, the responses to the eight utility-related survey questions were entered as dependent variables, while the subject area and teaching experience served as independent variables. The results showed that teaching experience was not significantly associated with the instructors' opinions on the utility of AI ($p > 0.05$ for all 8 items).

In the whole cohort, the results revealed low to moderately favorable opinions about the utility of AI. The lowest ratings of AI's educational utility were associated with the humanities instructors, who showed statistically significant differences from math, science, and technology instructors and from medical science instructors on the first four questions in Table 3. On the other hand, they provided the highest rating regarding the role of AI for making instructors' work easier (question 8), whereas the math, science, and technology instructors gave the lowest rating on the same issue, with a significant difference between the two ($p = 0.002$).

Table 3: Instructors' opinions on the utility of AI technology across subject areas

AI technology has the potential to ...	Math, science & technology **(1)**	Humanities **(2)**	Social sciences **(3)**	Medical sciences **(4)**	Arts music **(5)**	ANOVA p-value	Bonferroni p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
1) Improve the quality of instruction	3.29 (1.11)	2.97 (1.05)	3.23 (1.01)	3.36 (0.85)	3.22 (1.01)	0.001	2↔1: 0.002 2↔4: 0.019
2) Facilitate learning outcomes	2.84 (1.08)	2.61 (0.97)	2.78 (1.07)	3.00 (0.98)	2.78 (1.12)	0.015	2↔1: 0.048 2↔4: 0.029
3) Facilitate individualized education	3.07 (1.17)	2.83 (1.06)	3.05 (1.14)	3.25 (0.98)	2.93 (1.14)	0.014	2↔1: 0.029 2↔4: 0.049

4) Increase students' interest and engagement	2.81 (1.07)	2.52 (0.95)	2.76 (1.06)	3.00 (0.99)	2.68 (1.15)	0.001	2↔1: 0.005 2↔4: 0.003
5) Improve efficacy of assessment	2.58 (1.10)	2.49 (1.21)	2.43 (1.06)	2.65 (0.95)	2.80 (1.30)	0.223	
6) Stimulate creative thinking	2.51 (1.14)	2.43 (1.04)	2.37 (1.08)	2.42 (1.03)	2.53 (1.09)	0.931	
7) Stimulate critical thinking	2.51 (1.16)	2.52 (1.05)	2.52 (1.09)	2.58 (1.05)	2.51 (1.26)	0.991	
8) Make instructors' work easier	2.92 (1.01)	3.27 (1.08)	3.04 (1.07)	2.95 (1.13)	3.02 (1.25)	0.004	2↔1: 0.002
Mean of all items	2.79 (0.64)	2.71 (0.57)	2.76 (0.59)	2.88 (0.52)	2.79 (0.66)	0.206	

Measurement scale: 5- completely agree, 4 – agree, 3 –somewhat agree, 2 – mostly disagree, 1 – completely disagree

The trends revealed by the quantitative data were supported by the instructors' narrative comments, the majority of which contained mixed sentiments of positivity and skepticism. The coding of the responses into categories showed the following distribution: 11.10% (n = 101) favorable opinions, 56.40% (n = 513) ambivalent opinions, 17.70% (n = 161) skeptical opinions, and 14.80% (n = 135) comments stating that the participant could not formulate an opinion (Figure 3).

The Chi-square test revealed that a significantly higher percentage of the skeptical opinions was expressed by the humanities instructors (24.60%) compared to 15.70% in math, science, and technology, 15.20% in social sciences, 15.60% in medical sciences, and 14.60% in arts and music ($\chi 2 = 21.957$, $p = 0.038$). Teaching experience did not show a significant relation to the instructors' attitudes toward AI ($\chi 2 = 19.497$, $p = 0.077$).

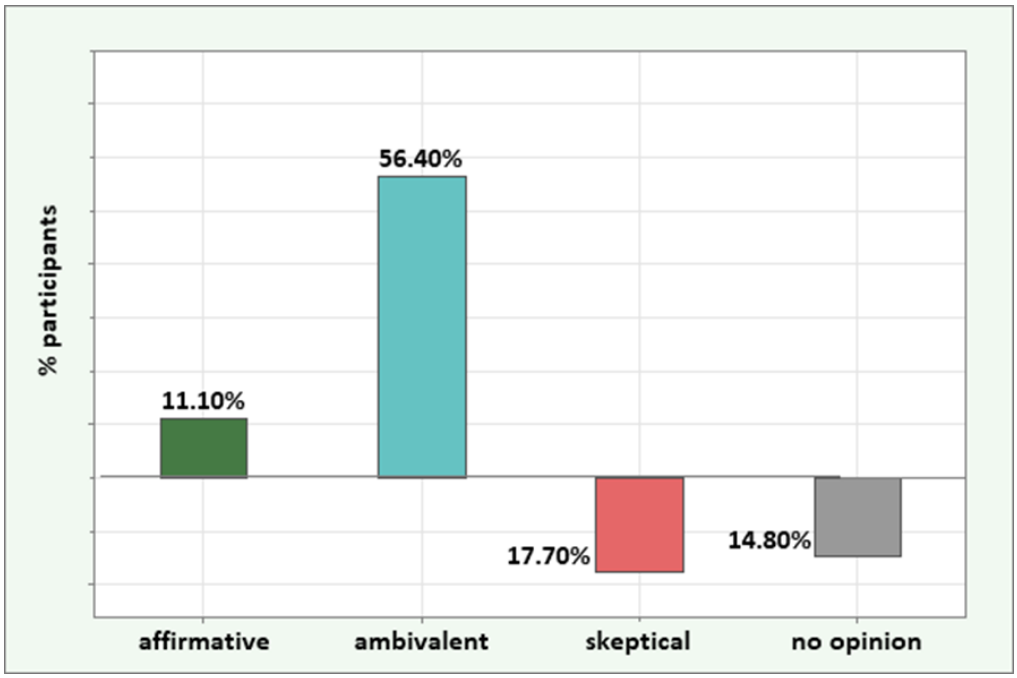


Figure 3: Results of the coding of the instructors' opinions on AI into categories

4.2.1. Affirmative opinions

4.2.1.1 'The implementation of AI is necessary and inevitable'

The most prevalent theme among the positive statements was that the implementation of AI in education was '*necessary and inevitable'.* The theme appeared directly or implicitly in 50 out of 101 positively connoted comments (49.50%). The participants pointed out that educators should not deny something that was already a fact and was certain to shape the future. They thought that university instructors should open-mindedly accept the challenge and prepare to make the most of it. The following quote from a female instructor in the specialty area of humanities, aged 30 to 39, encapsulates the opinions belonging to the category *'necessary and inevitable'*.

> '*Artificial intelligence is already present in many different spheres of human existence. Tools are expected to become more precise and diverse. It is short-sighted for educators to ignore something that is about to become an* ***inevitable part*** *of the lives of learners. Education should take advantage of the opportunities to optimize its processes. A large proportion of career paths will require learners to be able to work with AI. In this line of thought,* ***it is not possible*** *to avoid the application of AI in education. Therefore, let's approach it correctly, with solid preparation for all participants in the educational process and the provision of the necessary material infrastructure*.'

4.2.1.2 'Instructors should not lag behind their technologically-savvy students'

Another recurring theme from the favorable remarks was that instructors should not 'lag behind their students', who mostly belong to generations of learners inherently inclined toward technological advances. A male instructor of age group 50 to 59 from medical sciences wrote, '*If the education system, including higher education, does not change, there will be a mass outflow of students who will be able to easily self-learn with the help of AI*.'

4.2.2. Ambivalent opinions

4.2.2.1 'AI can be useful; however/but …'

A substantial number of the narrative comments (56.40%) included both positive and negative perspectives on AI technology and its application in education. The statements primarily comprised two components. The initial section identified the potential benefits of AI technology in education, whereas the following section outlined the essential conditions required to achieve this result. The conditions specified by the participants were more varied and revealing than the positive aspects. There was a belief that AI could serve as a valuable tool in education; however, both educators and students were unprepared to utilize it effectively and appropriately. They expressed skepticism regarding the potential bias and inaccuracy of the information provided by AI. Prior to the establishment of specific guidelines regarding domains of use, control of cheating and plagiarism, and other ethical standards, the application of AI should be approached with caution.

4.2.2.2 'It's like fire. You can cook a meal, but you can also burn down your house'.

Another subcategory of "mixed comments" expressed the instructors' opinions through more colorful expressions and metaphors. For example, a female instructor, of age group 50 to 59, teaching in the field of arts and music, used the following saying to describe her feelings towards AI: '*It's like fire. You can cook a meal, but you can also burn down your house'*.

A male instructor from the medical sciences who was in the age group of 50 to 59 made another metaphorical comment: '*AI is like a double-edged knife—it can be very useful but also*

dangerous. The risk is that both learners and teachers will become too lazy by having an easy access to information and "ready-made" solutions.'

A male instructor in the social sciences, aged 30 to 39, employed a comparable metaphor, but with a differing conclusion: '*Double-edged sword... It must be carefully managed; that is, we need to exercise control over AI, rather than the other way around.*

'To be or not to be. Homo sapiens???'' This comment was provided by a female instructor of age group 40 to 49, from the field of arts and music. In a laconic manner, she characterized the current state of the field as the perpetual dilemma that humans face when choosing a course of action.

According to a female instructor in the arts and music field, of age group 40 to 49, AI is a '*powerful weapon whose capabilities are yet to be on the world agenda, with or without our consent. In this line of thought, we should all be ready for the AI challenge. Whether it will be a system of fraud and plagiarism or we will harness it to the educational system—it depends on us.'*

4.2.2.3 'AI can be useful for certain contexts and objectives, but not entirely . . .'

A third subcategory of the mixed comments specified the educational contexts and objectives for which AI technology may be beneficial for gathering information for different projects, assessment and evaluation, personalized learning, alternative ideas and tasks, visualization, quizzes, and gamified instruction.

4.2.3. Skeptical opinions

The comments in this category contained expressive language to convey the instructors' skeptical sentiments about AI. They referred to AI as 'an evil', 'a waste of time', 'too primitive and dehumanizing', 'devastating', 'disturbing', 'stimulating cheating and plagiarism', 'demotivating', 'harmful for natural intelligence', and 'a hurdle for critical and creative thinking'. The opinions were unambiguously opposed to the notion of incorporating AI technology into education. The instructors expressed apprehension regarding AI's adverse impact on the efficacy of teaching and learning, academic integrity, equitable assessment, and the cognitive abilities of students.

4.3. Factors Associated with Favorable Opinions on the Utility of AI

The current analysis expands upon the previous one (section 4.2) by utilizing multivariate linear regression to establish a model of predictors for the instructors' positive perceptions of AI's usefulness. The dependent variable was *utility of AI*, and the predictor variables included two continuous variables (familiarity with AI and teaching experience) and two categorical variables (gender and specialty area).

The results (Table 4) showed three variables as being significantly associated with the instructors' favorable opinions of AI. The first one was *familiarity* with AI (Coefficient = 0.941, $p < 0.001$). The second significant predictor was gender (Coefficient = -0.0510, $p = 0.005$). The female instructors held less positive views (mean 3.27, SD = 0.930) on the utility of AI compared to the male instructors (mean 3.59, SD =0.981). Specialty area reaffirmed its significant association with the instructors' opinions on the utility of AI in combination with the other two predictors. In table 4, the humanities instructors are associated with a negative regression coefficient versus the math, science and technology instructors, indicating significantly less favorable views ($p < 0.001$). The same tendency is exhibited by the arts and music instructors; however, it is not significant ($p = 0.620$). Teaching experience was removed from the regression model because it was not significant.

As a whole, familiarity with AI, subject area and gender explained 92. 93% of the variability in the instructors' opinions on the utility of AI (R-square = 92.93%; R-square adj. = 92.83%.).

Table 4: Results from the multivariate regression analysis (Backward elimination method)

Predictor	Coefficient	SE	t-value	p-value	VIF
Familiarity with AI	0.941	0.09	106.25	<0.001	1.03
Gender: versus *Male*					
○ Female	- 0.051	0.01	-2.79	0.005	1.08
Specialty area: versus *Math, sciences and technology*					
○ Humanities	-0.197	0.032	-5.99	< 0.001	1.15
○ Social science	0.021	0.024	0.89	0.314	1.30
○ Medical sciences	0.016	0.043	0.39	0.697	1.09
○ Arts and music	-0.01	0.021	-0.50	0.620	1.43
○ Constant	0.210	0.036	5.69	< 0.001	n.a.

Note: VIF - a variance inflation factor. Values below 5 indicate low or lack of multicollinearity (Akinwande et al., 2015).

4.4. Problems Associated with the Implementation of AI into the Educational Process

The instructors were asked to describe the main problems they had encountered or anticipated when using AI tools in their teaching practice. Of all 910 participants, 890 (97.80%) responded to this question, and the remaining 2.20% (n = 20) were unable to comment on the issue. The data was coded into recurrent themes, which are presented below.

4.4.1 Assessing student work when AI aid is detected

The instructors frequently mentioned the challenge of evaluating student assignments upon identifying the use of AI assistance. One issue highlighted by the educators was the absence of explicit guidelines regarding the permissible circumstances for utilizing artificial intelligence, the specific objectives or tasks it may assist with, and the extent of its application. Another problem they faced was the lack of specialized software that could accurately identify the assistance artificial intelligence provides. The instructors indicated that they lacked unrestricted access to AI-detection software due to the absence of a subscription at their respective institutions. Others reported that they had utilized the trial version of the ChatGPT AI detector but were unable to afford a monthly subscription. The third challenge concerned the time required to evaluate all students' work for AI assistance. A closely related issue was the lack of established assessment criteria when identifying AI assistance. Several instructors indicated that they had adopted the 20% limit on AI assistance established by academic journals within their respective disciplines; nonetheless, they expressed uncertainty regarding the proper application of this guideline.

4.4.2. Inadequate preparation for the effective and efficient use of AI technologies

The inadequacy of educators in addressing the difficulties posed by AI-powered technologies was the second most prevalent topic. The *haphazard use of AI apps* was a recurrent comment. The instructors mentioned that being familiar with some of the trending AI apps was not sufficient to be able to use them for educational purposes. They were concerned about the lack of fundamental knowledge and competencies about how to utilize AI technology *in* their teaching and research. This issue was particularly dominant in the comments of those instructors whose specialty areas were outside the fields of information technology, math, and science. Another issue was the *rapid release of new AI apps*. To some instructors, the fast developments in AI technology, the continuous updates of older apps, and the release of new ones created an additional frustration. Some instructors were worried that they already were or soon would be less competent than their students in the use of AI and that they *may be lagging behind their students.* They emphasized the need for face-to-face and online training seminars.

4.4.3 Uncertainty about the long-term effect of AI-use

The uncertainty about the long-term effects of AI technology on the educational system was another issue that surfaced through the instructors' comments. They asserted that it was premature to become 'fascinated by AI technology' because of the unclear outcomes in several aspects. In their comments, the instructors expressed a concern that the reliance on AI tools may negatively affect the *value of formal education*. They were concerned that the ease of producing information using AI technologies may diminish the instructors' importance and increase students' frustration with conventional instructional methods. Another uncertainty concerned the effect of AI on students' *cognitive development*. This theme already appeared in the previous questions; however, it was further elaborated on by some of the instructors who worried that their students were already becoming '*lazy*' and '*unable to think for themselves*.' They were concerned that the most unique characteristic of humans, the ability to think creatively, critically, and abstractly, would be diminished by the overreliance on AI tools. The instructors were not sure about the effect of AI on *human and classroom interaction*. They feared that the personalization of education through AI tools would gradually reduce the time spent on classroom interactions, face-to-face discussions, debates, and other more traditional approaches that aim to create supportive classroom environments. Last but not least, they were uneasy about the future of *educators' jobs* as they feared that AI may replace institutional education with self-learning and thus make their role as educators redundant.

5. Discussion

The data reported in this article was collected in the beginning of 2024, a time that was characterized by a proliferation of generative AI tools and a growing momentum in the official discourse on the utility of AI in education. At the same time, formal guidelines and policies about AI's use were still under development, making the results of the current study reflective of the educators' initial impressions, intuitions, expectations, and predictions about the potential benefits and downsides of AI tools.

One of the trends that emerged from the data analysis was that Bulgarian university instructors were curious about the new AI technology and had made the effort to familiarize themselves with its most popular applications. Only 1.30% of the instructors indicated being entirely unfamiliar. The qualitative data revealed that chatbots, including ChatGPT, Gemini/Google Bard, Copilot, and Perplexity, were the most popular AI-powered tools among Bulgarian higher education instructors. Amidst them, ChatGPT was the most popular as it

appeared in 95.50% of the responses. This finding was not unexpected, as ChatGPT has been the subject of numerous research studies that have examined its benefits and drawbacks for various educational purposes, including student assessment (Baidoo-Anu & Ansah, 2023; Bozkurt et al., 2023; Farrokhnia et al., 2024; Grassini, 2023; Kiryakova & Angelova, 2023; Pisica et al., 2023).

Less popular among the surveyed educators were AI tools that can turn textual prompts into images, audio, and videos, such as DALL-E, Midjourney, Bing Image Creator, PlayHT, and Synthesia (Ministry of Education and Science, Guidelines). Due to their specific functions, these types of apps best meet the needs of instructors in arts and music, and not surprisingly, they were the most frequently mentioned in their responses.

The quantitative analysis showed two factors as significantly related to the educators' familiarity with AI tools: age and specialty area. There was an adverse link between the level of familiarity with AI and the age of the instructors, with the youngest (20–29 years) reporting the highest level of familiarity and the older age groups (50–59 and over 60) showing the lowest level of familiarity. Regarding specialty areas, the math, science, and technology instructors were the most familiar with AI tools, whereas the humanities instructors were the least familiar. Research conducted on students and teachers in lower educational levels has revealed that younger individuals who have grown up in a technologically advanced society, referred to as "digital natives" by Prensky (2002), possess a natural proclivity toward technology and nearly native-like technological competence (Chan & Lee, 2023; Hernandez-de-Menendez et al., 2020; Kim & Kim, 2022; Puiu, 2017; Tshuma, 2021). Our findings demonstrate the validity of the relationship between age and technology in the context of higher education. Conversely, this relationship stands in contrast to Terzi's (2020) findings, which indicate an absence of correlation between teachers age and their sentiments toward AI.

It was reasonable to expect that instructors in technology-dependent disciplines would feel responsible to follow and not fall behind the advancement of AI technology compared to their counterparts in fields that are less technology reliant. Nonetheless, the finding sheds light on the importance of personal motivation and interest in the exploration, testing, and eventual use of certain technological innovations as discussed in the introduction of this paper (Al-Furaih & Al-Awidi, 2020; Ayanwale et al., 2022; Darmansyah et al., 2020; Davis, 1989; Nikolopoulou, 2021; Yue et al., 2024).

Quantitative and qualitative data were employed to investigate the instructors' perspectives regarding the effectiveness of AI technology in educational settings. Both analyses revealed moderately favorable opinions, tempered with conditional optimism alongside skepticism and concerns. For the most part, the ambivalent responses constituted the largest proportion of the qualitative data (56.40%). Syntactically, these statements consisted of two clauses. The first part expressed conditional trust in AI's utility through phrases of the type: 'It can/maybe/has the potential to be/could be..'. The second clause provided the reasons for the instructors' hesitancy. The lack of teacher preparedness, the need for training, the lack of ethical norms and guidelines, and the rapid release of new AI tools were the most frequent reasons for the instructor's mixed feelings toward AI's effect on education.

Some participants used metaphors and similes to express their opinions on AI, typically highlighting the hidden dangers of these tools through comparisons like *fire*, a *double-edged knife*, or a *double-edged sword*. For other instructors the use of AI tools had to be confined to certain educational contexts and purposes, such as gathering information, student assessment, personalized projects, and visualization.

The predominance of mixed sentiments toward AI aligns with the findings of related studies at higher education institutions, which also revealed a multilayered canvas of perspectives with different nuances of positivity, skepticism, concerns, and even fears (Borisov & Stoyanova, 2024; Kiryakova & Angelova, 2023; Pisica et al., 2023). Moreover, they support

the forecasts discussed in more theoretical research (Baidoo-Anu & Ansah, 2023; Bozkurt et al., 2023; Farrokhnia et al., 2024; Grassini, 2023).

A smaller proportion of the participants expressed affirmative opinions on AI as an innovation that has already made its way into various domains of society. They viewed AI's implementation in education as necessary and inevitable. Undoubtedly, those instructors held the belief that refusing to embrace and utilize AI's affordances would negatively impact the quality of education, which is responsible for delivering contemporary competencies and skills that align with societal demands and the needs of the 'digital-native' learner (Prensky, 2001).

Complete confidence in AI's utility for education is rather uncommon during this transitional period, when most stakeholders exercise caution and avoid unqualified optimism. In this context, the unwavering support of some educators seems somewhat out of place and incomparable to the reported tendencies in the reviewed publications.

Only 17.70% of the participants clearly opposed the idea of integrating AI technology into education. The instructors voiced concerns about AI's negative effects on teaching and learning effectiveness, academic integrity, fair evaluation, and students' cognitive ability. Their counterparts at other Bulgarian universities (Borisov & Stoyanova, 2024; Kiryakova & Angelova) and in other countries (Iqbal et al., 2022; Pisica et al., 2023) shared similar concerns, albeit not with the same degree of determination.

As a whole, familiarity with AI, subject area, and gender accounted for 92.83% of the variability in the instructors' opinions on the utility of AI. The most powerful predictor of favorable attitudes towards AI was the participants' degree of familiarity with AI. This finding falls in line with the conclusions of a study by Yue et al. (2024), which determined that instructors who were better acquainted with and already using AI tools shared more favorable views about AI's educational capabilities. Research by Kim & Kim (2022) offers more support for the value of practical experience. The authors observed that educators' perceptions of AI might positively evolve after hands-on experience with a particular tool.

The lack of preparedness for the effective use of AI technologies emerged as a significant issue among the educators in the present survey, particularly for those whose expertise was outside computer technology, mathematics, and science. Consequently, the instructors characterized the present use of AI as chaotic and superficial. They expressed fear that their insufficient foundational knowledge and skills, along with the rapid emergence of new AI technologies, would lead to feelings of inadequacy in comparison to their technologically adept students. Some instructors were apprehensive of the waning importance of formal education and the devaluation of their roles as educators, eventually leading to job loss. The latter concern was raised by Rumanian university instructors in the study of Pisica et al. (2023).

Another issue that some of the instructors raised was the need for free access to professional software capable of accurately detecting AI help, together with defined evaluation criteria for instances of identified AI support.

6. Limitations

The findings of this research are subject to change over time due to advancements in ethical standards, methodological guidelines, and educational training opportunities in the various specialty areas of higher education. The current research just provides a point of reference against which these advancements can be compared.

Survey research inherently presents extra constraints, enabling the examination of large samples yet missing the breadth of data generated through direct interaction with the participants. The qualitative data obtained from the survey effectively illustrated the quantitative patterns; nonetheless, it could not substitute for in-depth qualitative investigations.

7. Conclusion

At the threshold of AI's entry into the educational system, Bulgarian higher education instructors were aware of the inevitable changes that its adoption would bring to the existing educational paradigm. Although they seemed quite familiar with the most popular AI tools, they acknowledged deficiencies in their preparedness and emphasized the need for training opportunities that would provide them with the knowledge and skills to optimally and effectively use AI's capabilities.

The educators outlined the risks associated with unethical use of AI and underscored the urgent establishment of norms and guidelines. Extrapolating from their comments, it is essential to explicitly delineate the scope, objectives, and domains of AI use. Personalized education emerged as a positive asset of AI, aligning with diverse learner profiles. It was also viewed in a negative way for fear of devaluing the role of educators and classroom dynamics. The lack of scientific data on the long-term effects of AI on students' cognitive abilities and creative thinking emerged as another concern and reason for skepticism.

To address the prevalent ambivalence over AI and the accompanying apprehensions, educators must be assured that its implementation will be conducted judiciously and appropriately, taking into account the subject area and its particular requirements. To help instructors gain confidence in their own abilities to utilize AI effectively and convince them of the benefits of adopting this new technological innovation, a variety of training options should be provided within smaller academic units, universities, and countrywide. Online sessions, discussions, and user groups could bring together instructors of various institutions nationally and internationally.

Developing educators' expertise in AI technology would enable them to choose the most suitable tools and minimize misuse and adverse outcomes. AI training is especially important for instructors in less technologically advanced disciplines and for age groups who did not grow up with technology during their formative years.

University administration and relevant stakeholders may also consider offering technical assistance, computer facilities, and institutional subscriptions for dependable AI tools and AI-detection software, hence enhancing instructors' confidence in using AI.

One instructor's appeal could potentially serve as a motto for colleagues and educational administrators: 'Let's approach it correctly, with solid preparation of all participants in the educational process and the provision of the necessary material infrastructure.'

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Informed Consent Statement: Following the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments, the participants were asked to provide their consent for participating in the survey and for using the data in scientific publications. They were assured about the anonymity of their responses.

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