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University teachers' perceptions of AI integration: Insights from a qualitative focus group study

Introduction and literature review

Artificial intelligence is revolutionizing people's daily lives by providing practical solutions to their problems and making their lives more comfortable. It contributes to a sustainable lifestyle by enabling the automation and intelligent control of household appliances and even optimizing energy consumption based on individual habits (Mandić, 2022). AI is crucial in many areas of life, such as healthcare, analyzing large amounts of data and recognizing patterns in diagnosis and treatment (Meskó & Görög, 2020). In the transport sector, AI will revolutionize road safety and reduce accidents through automated vehicles and intelligent transport systems (Németh, 2021). The list of areas where it is providing new innovative solutions to meet human needs is endless.

Artificial intelligence offers practical solutions, promotes a more comfortable way of life, and contributes to a sustainable way of life (Poola, 2017). The revolution in AI is not only impacting everyday life but is also having a significant impact on educating industrial and technical professionals. The spread of AI-enabled technologies in the industry is creating new challenges in the training of IT professionals who must learn to design and operate AI-enabled systems and understand AI's ethical and social challenges. As AI evolves rapidly, the workforce needs continuous training to keep up with new technologies and applications (Jungmann et al., 2020). Integrating AI into all aspects of life also means that today's workers and professionals need new skills and competencies to use AI to solve various problems and to innovate effectively. It makes education especially important to manage and exploit the technological changes behind AI.

Industrial workforce transformed by artificial intelligence
Big data and artificial intelligence are critical to the competitive growth of the industry, as companies are adopting these technologies at a rapid pace. In artificial intelligence, labor market needs still need to be met by those trained in vocational and higher education. (Johnson et al., 2021) The development and optimization of manufacturing processes are closely linked to the data-driven culture and the industrial artificial intelligence (AI) ecosystem. Data-driven culture means companies regularly collect and analyze data during production processes and make decisions and improvements based on them. The AI ecosystem involves integrating AI technologies, algorithms, and systems into production processes. A proper symbiotic interaction between humans and AI remains to be discovered, although workers and engineers play a crucial role in industrial AI applications. Although human involvement is essential, artificial intelligence is essentially the player in the process, with humans making the decisions. Parties need to understand AI-driven decisions better so that they can accept and trust them in the future. (Peres et al., 2020)

This process has a significant impact on the training of the workforce. Employees will need to acquire new skills and knowledge to implement AI. Understanding how AI technologies work, how to use data to optimize processes effectively, and how to manage AI-based systems is essential for those who work there. Employees can perform their jobs more effectively and efficiently by understanding and learning how to use AI technologies. The result can be an increase in work efficiency and productivity. At the same time, workers will need to be flexible and adaptable and continually educate themselves in new technologies and processes to meet the new challenges and opportunities that the application of AI brings.

Artificial Intelligence and Education: challenges and opportunities
Slowly, almost imperceptibly, AI has crept into almost every area of human life over the past few decades. AI-based technologies aim to enable machines and computers to perform tasks that used to require human intelligence. The application of AI is already impacting our daily lives and could bring

even more significant changes in the years to come. Advances in AI are revolutionizing education by facilitating the transfer of knowledge and the optimization of training. Learning will become more motivating, enjoyable, and effective through interactive digital content and e-learning frameworks (Lin et al., 2021). Appropriate use of AI opens hidden opportunities for development (Huang et al., 2023).

Applying AI has also shown great educational potential (Ady & Terpecz, 2018). Ahmad et al. (2022) found that most of the work related to MOOCs (massive open online courses) is done using AI/machine learning (23%), big data (20%), and gamified technologies (17%). Therefore, AI can be widely used in education (Chen et al., 2020), and it can help teachers create teaching materials assessments or even evaluate students. Alongside these benefits, there are many challenges to applying AI to education (Dietz, 2020). The teacher's role changes, data protection, personal identification, and cyber protection issues arise (Alghamdi & Ragab, 2022). Nevertheless, AI is expected to play an increasing role in education (Dimitriadou & Lanitis, 2023), and its use in education offers promising opportunities for students and educators (Kasneci et al., 2023). AI technologies can optimize educational processes. They can provide support and tools for teachers and students. It can also contribute to more efficient education and create opportunities for all students' successful learning and development.

Perhaps more attention has been paid to AI-based systems because of the widespread appearance of ChatGPT. ChatGPT is a significant language model chatbot, an AI-based system that can provide realistic and intelligent answers to user questions. In the free version (3.5), the program can generate content on subjects with little information. ChatGPT hallucination is often used to describe this phenomenon. It is essential that everybody treats the replies of the chatbot carefully and check the information given. (Deng & Lin, 2023)

AI can provide significant support to educators in various aspects of education, such as the development of curricula, research materials, sets of tasks, and the automated scoring of exams. AI will not replace teachers, but it can help them. The study focuses on the use of AI in education, looking at AI-based systems that can help teachers create teaching materials, prepare assignments, and administer exams. The research used a focus group discussion to explore participants' awareness of and experience with AI-based applications. The discussion aimed to pave the way for innovative ideas and solutions by mapping educators' opinions, attitudes, and knowledge about the use of artificial intelligence in higher education.

The purpose of the research, research questions, and research method

Our research examined the role of artificial intelligence (AI) in education. Based on the participants' experiences, we examined the possibilities of the use of AI in support of the work of educators. We analyzed in detail the help of AI in preparing teaching materials, i.e., the creation of questions based on different aspects. In addition, we investigated the use of AI in the supervision of students during the exam, for example, in identifying candidates. Our particular focus was on the potential of AI in the exam assessment, including automated scoring and the preparation of text assessments. Our research looked at what types of tasks AI could effectively assess during the exam and what types of exams would be ideal for using AI. There has also been research into how teachers can be effectively prepared for using AI in the classroom.

This study uses empirical, qualitative research methods to conduct focus group interviews with engineering teachers at the University of Obuda. The focus group discussions were used to map the lecturers' knowledge, attitudes, and opinions regarding Artificial Intelligence methodologies and explore in detail the possibilities of using AI in the teaching process. During the conversation, we collected responses using a specific set of questions, which we transcribed. The content of the conversations was subjected to a structured analysis, a thematic analysis, and an interpretive analysis, and then a narrative analysis of the text was carried out.

Participants in the study

During the research, we asked 12 educators to participate in the focus group discussion to investigate their knowledge of artificial intelligence-based systems. The interview was conducted online using the TEAMS application. The teachers were divided into four groups during the research. Those who regularly use AI and know its benefits and limitations were the largest group. A quarter of the respondents were teachers aware of the possibilities of using AI but still needed to gain experience with it. The group with a participation rate of a quarter included those members of the respondents who had heard about AI but who needed to be made aware of the advantages and limitations of AI. Those who had never heard of AI and were unaware of its applications formed the smallest group. From that, only 17% of the group surveyed had not heard of AI. This classification helped to understand teachers' different preparation levels and attitudes to AI, which may be necessary for developing educational processes and more effective use of AI.

Introduction of research results

This analysis provides insight into how artificial intelligence technologies could impact online and face-to-face assignments, exam preparation, and delivery. The interview results allow us to gain insight into the advantages and disadvantages of using the technology from a teacher's perspective of effective user-friendliness.

Narrative analysis: In-depth study and interpretation of textual data
The transcript of the corpus analyzed in this study consisted of 8220 words, of which 2223 unique words could be identified, reflecting the diversity and richness of the vocabulary used. The density of vocabulary, which indicates vocabulary richness, was found to be 0.270, indicating a moderate level of word diversity in the text. The value of the readability index, which measures the complexity of the text, is 14.473. It indicates a moderate level of complexity. Moreover, the average number of words per sentence is 24.0, indicating sentence length and syntactic structure. The most frequently used words and phrases in the conversation are shown in the word cloud in Figure 1.

Figure 1 Words and phrases most frequently used during focus group discussion

(Edited by the authors)

The high frequency of the terms "artificial" and "intelligence" (n=41) indicates that they are mentioned in the text due to the interview context. The respondents' positive attitude towards using and applying artificial intelligence is indicated by the relatively high frequency of the term "good" (n=23). A possible relationship between the two concepts is indicated by the equal frequency of "ChatGPT" and "exam" (n=22), which suggests that they have a similar meaning and presence in the analyzed text. A deeper analysis of the text shows that, in many cases, the expressions aim to prepare for the exam, prepare the students, and support the teachers. The term "methods" (n=11) indicates that the text discusses different approaches, techniques, or methodologies related to the topic. The term "help" (n=8) indicates that the text deals with helping or supporting using artificial intelligence methods.

Significant relationships between specific terms in the dataset were found in the correlation analysis. The word "opportunities" shows a strong positive correlation with the term "teachers" (correlation

coefficient: 0.906, p-value: 0.001), indicating a close relationship between these concepts. The interview revealed the number of contact points between teachers and using artificial intelligence devices in the classroom. Such valuable points could be preparing course materials, textual annotation of course materials, generating exam questions and answers, preparing exams, generating tasks, automating exams, and correcting. Similarly, the term "method" has a strong positive correlation with the term "exam" (correlation coefficient: 0.821, p-value: 0.003), suggesting a close relationship between the two. In the analysis of the text, this relationship indicates which methods are used in exams in higher education.

Furthermore, the term "chatgpt" shows a moderately strong positive correlation with both "advantage" (correlation coefficient: 0.758, p-value: 0.011) and "help" (correlation coefficient: 0.701, p-value: 0.024), indicating the relationship between the advantages of ChatGPT as a featured AI application and help. This application was the most frequently mentioned due to its familiarity, so in many cases, the focus of the responses was on the use and possibilities of this application. The observed correlations are statistically significant, given the low p-values associated with these correlations. These results suggest that the possibilities and the teachers are closely related, that the methods used to analyze the responses are related explicitly to the exams, and that using ChatGPT benefits and helps the teachers in their work.

We also used various textual analysis methods to identify patterns and relationships that enhance overall content understanding. For example, word frequency analysis was used to identify and quantify the occurrence of certain words in the corpus. We could highlight the prominent role and the importance of certain expressions in the text. Word composition analysis was also used to look at co-occurrence patterns, revealing relationships and associations between words.

Knowledge of and attitudes toward AI methods among teachers
During the study, teachers were asked when they first encountered AI, and their responses allowed us to identify the pre- and post-ChatGPT timeframes. Before ChatGPT appeared, the teachers who teach on this topic (3 people) and four teachers stated they were interested in using artificial intelligence. Three teachers are interested in this subject but have yet to gain experience. 2 participants stated that they were practically aware of artificial intelligence for the first time. It had not concerned them until now.

In response to whether AI-based applications could replace teachers, all respondents agreed they had no concerns. Although not all respondents were very vocal, it was clear that most were optimistic about the issue, focusing on the benefits rather than the drawbacks.

Effective use of AI in assessment
AI can significantly assist teachers in the examination process, helping with exam preparation (e.g., generating questions based on given criteria), monitoring exams (e.g., verifying student identity), and evaluating exams (e.g., automatic scoring and text evaluation). Several attendees commented that they would find it helpful to be assisted by an AI-based application when composing their questions. None would like to entrust the exam supervision to an AI-based application. Most teachers say that verbal feedback is still an excellent way to discourage cheating and is effective in small groups. Group members were divided on the possibility of using ChatGPT during the assessment. Some emphasized its benefits and its conscious use. Others had a strongly negative view of it and wanted to restrict its use during exams.

Even though the participants had yet to use the AI-based tools during the examination or in preparation, there was a sense of urgency about the use of the AI-based tools. Several people mentioned that if they were more familiar with these applications, they would use them not only in preparation for the exam but also to make their work easier and use them for other purposes.

Benefits and challenges of using AI in education
Several factors influence the efficiency and accuracy of artificial intelligence applications in education. Objective questions that require clear answers work well with AI applications and can help optimize

the examination process. AI can also be challenging to apply to more complex and ambiguous issues, requiring further development and refinement.

AI applications can efficiently and quickly score learner responses in online exams, helping trainers streamline exam processes and provide objective and reliable scoring. However, AI may still have limitations regarding more complex problem-solving and interpretation tasks. Technical tasks may include creating schematics, program plans, or block plans. The current state of development of AI still needs to be able to perform these tasks with sufficient accuracy and reliability, as they tend to be more complex and require a higher degree of human interpretation and creativity. Respondents considered using AI most appropriate for written exams, but at the same time, they did not consider using AI relevant for oral exams. Trainers agreed that preparing for AI would require further training for all trainers, especially examiners.

58.3% of educators participating in the focus group discussion expressed that they would like to use AI-based applications in education to facilitate their work and develop better-quality teaching materials. However, 41.7% needed help with how to handle them. Only 25% said yes when asked about the use of online exams. A further 16% still need to give a clear answer. 59% openly rejected the use of such applications. To conclude, it was possible to filter from the focus group discussion that providing teachers with further training on this issue was necessary. In many cases, the mistrust is holding teachers back from using AI-based applications.

Key points regarding the use of AI in education
The study explored the experiences and opinions of educators regarding the use of artificial intelligence (AI) in education. Those surveyed included experienced AI teachers and those who have only recently become aware of the technology. All respondents agreed that AI-based applications will not replace teachers in education. However, they predicted a change in the role of teachers in the educational process. Teachers would like to use AI in online/offline examinations, especially in creating questions and scoring exams more efficiently.

The use of AI in the examination process can provide efficiency and accuracy based on the focus group discussion results. For objective questions, AI-based applications work well and can help to optimize, but more complex tasks require further development. Trainers saw the most significant potential for using AI in written examinations while using AI in oral examinations was not considered relevant. There was agreement among the trainers that it would be necessary to prepare the training participants for such a change. The study showed a demand for and interest in using AI methods and tools among the participants. However, further training and trust-building among trainers were needed to ensure the practical applications would be widely adopted.

Summary, conclusion, and future work

By transforming the learning process, enabling the development of more effective teaching methods, and improving teaching activities, AI is expected to impact the future of education significantly. AI can help educators better understand their students' strengths and weaknesses, making it easier for them to tailor the curriculum and teaching methods.

AI can also save teachers time and energy by automating the assessment of student performance. AI allows educators to focus on personalized mentorship, which can help students achieve better results and progress in the long run. AI in education needs regulation. The aim is not to prohibit it but to use it within reasonable limits. Educating teachers to communicate with artificial intelligence is essential.

The focus group discussions revealed that teachers have a positive attitude towards AI. None of the teachers clearly rejected the use of AI applications, partly because AI is not a new technology. It is also because most teachers are accustomed to being constantly in touch with technological innovations because of their education at a technical university. In this study, we have approached the topic from the teachers' perspective; in the future, we would like to examine the use of AI in education from the students' perspective.

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