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# Pre-service teachers' attitudes towards artificial intelligence and its integration into EFL teaching and learning

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**Abstract**

Even though artificial intelligence (AI) is no new occurrence, with its beginnings dating back to the 1950s, its use has gained popularity worldwide, especially in recent years, and its presence and importance has grown in many areas of human lives, including education. Surveys conducted internationally have found generally positive attitudes of university students towards artificial intelligence (AI) and its inclusion into various fields of research and study. However, only few research probes have been conducted among students of philology and future language teachers. No such research has been conducted among university students or pre-service EFL teachers in Central Europe. This paper aims to fill this gap in educational research knowledge, as knowing teachers' and teacher students' attitudes towards AI can be a key factor in the success or failure of applying AI in education. Therefore, the aim of the study is to determine the level of knowledge and dominant attitudes towards AI in general, AI in learning/teaching EFL and the inclusion of AI in the teacher training curriculum among pre-service EFL teachers in Slovakia.

To collect data from the respondents, a cross-sectional survey in the form of a KAP questionnaire was conducted in November-December 2022. 137 pre-service English language teachers responded to a pre-tested online questionnaire consisting of 19 closed-ended (5-point Likert scale) items and one open-ended question.

Slovak EFL pre-service teachers were equally interested (38.67%) and uninterested (39.42%) in the ongoing discussion about AI in education. Overall, they self-reported having no (61.31%) or unsatisfactory (21.17%) understanding of the basic computational principles of AI. On the other hand, they were significantly more satisfied with their knowledge of AI-based applications for EFL teaching, which they considered adequate (35.04%). Nevertheless, almost half of the students (45.25%) rated their knowledge as inadequate. It was therefore encouraging to learn that 64.24% of the respondents agreed that AI education should be included in their university curriculum and had predominantly positive expectations of AI and its application in education. 63.50% of them agreed with the statement that AI will improve education in general (compared to only 18.98% who disagreed). They shared a predominantly positive attitude towards the incorporation of AI into EFL and showed their optimistic expectations regarding the impact of AI on teaching and learning English as a foreign language. Slovak EFL pre-service teachers did not express any concerns about the future of their profession. However, a majority of them (53.28%) agreed that EFL teachers might lose some of their skills when using AI in their practice and a significant number (42.33%) feared that AI would make EFL teaching less personal. These findings are consistent with previous research conducted internationally.

**Key words:** AI, attitudes towards AI, pre-service EFL teachers, AI-powered foreign language education, AI-powered EFL teacher training

### 1 Introduction

Over the past few decades (since the 1950s), artificial intelligence (AI) has received unprecedented attention and is seen as one of the triggers of the fourth industrial revolution (Quiang, 2018). Among the fields that have undergone a profound transformation with the integration of AI is higher education. The impact of AI on higher education is multifaceted, and some developments, like the opening of AI-based language models such as ChatGPT to the public, open up a new era of possibilities and can lead to ground-breaking changes not only in teaching and assessment methods. Based on the conclusions of numerous institutional, national and international analyses (e.g. Bates, Cobo, Mariño, & Wheeler, 2020; Chassignol, Khoroshavin, Klimova, & Bilyatdinova, 2018; Cojean, & Martin, 2022; Cukurova, Luckin, & Kent, 2020; Kandlhofer, Steinbauer, Hirschmugl-Gaisch, & Huber, 2016; Nazaretsky, Ariely, Cukurova, & Alexandron, 2022; Ninaus & Sailer, 2022; Renz, & Hilbig, 2020; Sharkey, 2016; Zawacki-Richter, Marín, Bond, & Gouverneur, 2019), these are three main changes triggered by the incorporation of AI in higher education that can benefit university teachers/students:

a) **evolutionary and revolutionary changes in teaching methods** - AI has significantly enriched the range of tools available to educators to make their teaching more effective. While some of them modernise and innovate traditional methods and approaches (e.g. intelligent writing assistants and translators), others bring new actors and new quality to teaching (e.g. virtual assistants and chatbots),

b) **personalisation of higher education learning environments –** AI-powered tools can help educators meet and support the diverse needs and learning styles of individual students. AI-based adaptive learning systems are highly effective at analysing students' strengths, weaknesses and preferences, allowing educators to tailor educational content and create personalised learning environments,

c) **better management of education** – AI can help teachers manage their administrative tasks, facilitate communication with students and provide real-time feedback. This can significantly reduce teachers' workload, allowing them to focus on effective teaching.

d) **more accessible education** – access to AI-based educational platforms is not necessarily limited by institutional or geographical barriers. This opens up further practical opportunities for inclusive teaching and the internationalisation of higher education, including better access for learners with different disabilities or from different social and cultural contexts.

### Attitudes towards AI

There is no doubt that AI technologies have the potential to fundamentally reshape our society and economy. AI brings both important benefits (increased productivity and efficiency in many tasks, new jobs, etc.) and serious risks (the rise of fake news and desinformation, job displacement, ethical issues, etc.). The promises and pitfalls of AI are intertwined, raising critical questions about how to strike a delicate balance between potential benefits and potential harms.

This duality, influenced by a complex of different personal, societal, cultural and ethical considerations, shapes people's attitudes towards AI technology. Understanding these attitudes and their determinants is crucial for the further development and sustainable integration of AI in work and education.

When Fast and Horvitz (2017) analysed news coverage of AI in the New York Times over three decades, they found an increasing number of stories from 2009 onwards and a general increase in optimism in coverage. However, their analysis also pointed to a significant increase in public anxiety around the issues of loss of control over AI, lack of transparent decision-making processes, ethical issues, and job loss.

A similarly mixed response was also received by Anderson, Rainie, and Luchsinger (2018), who asked 979 experts what they think and believe about AI and its future. As a result, they provided an insightful resource summarising both benefits (e.g. increased work efficiency) and threats (e.g. increased social isolation, destructive impact on many jobs, misuse of data, loss of intelligent behaviour in humans, existential threats to humanity).

In 2019, Cave, Coughlan, and Dihan (2019) conducted a nation-wide representative survey in the UK. They found that the majority of the public associate AI with fears and negative dystopian predictions (e.g., AI will eventually take over humans).

In the same year, Zhang and Dafoe (2019) surveyed US citizens about their attitudes towards AI and its use in their daily lives (through applications such as Google, Siri, Alexa, etc.). They, too, found a mixed attitude of support and concern towards AI. The vast majority of respondents (82%) called for caution in the development and management of robots, but more participants (42%) supported AI than opposed it (22%).

A year later, Neudert, Knuutila and Howard (2020) published the results of the first global survey of attitudes towards AI (N = 154,195 respondents from 142 countries). The authors found significant differences between continents, countries and regions. They confirmed a clear east-west divide in public attitudes towards AI and AI-driven tools. Concerns were highest in Latin America (49%) and North America (47%). Conversely, the lowest levels of concern were measured in South East Asia (25%) and East Asia (11%). China was identified as the most optimistic and enthusiastic country, with only 9% of respondents believing that the development of autonomous robots and intelligent machines would harm humans.

### Research into the opinions and attitudes of university students

Since 2019, several studies have been conducted on the attitudes of university students towards AI. The respondent groups were composed of students from the fields of economics and administration (e.g., Keleş & Aydın, 2021) and different fields of medicine and health care (Ahmed, Bhinder, Tariq et al., 2022; Al Hadithy, Al Lawati, Al-Zadjali, & Al Sinawi, 2023; Al-Qerem, Eberhardt, Jarab, et al, 2022; Asmatahasin, Pratap et al., 2021; Baigi, Sarbaz, Ghaddaripouri et al. 2023; Doumat, Daher, Ghanem, & Khater, 2022; Fernandes, Bafna, Patel, & Parmar, 2022; Pinto Dos Santos, Giese, Brodehl et al., 2019; Teng, Singla, Yau et al., 2022; Truong, Vo et al., 2023; van Hoek, Huber, Leichtle, et al., 2019 and others). Their findings can be summarised as follows:

- Generally, students were aware of AI applications in their respective fields (Ahmed, Bhinder, Tariq et al., 2022); Asmatahasin, Pratap et al., 2021; Fernandes, Bafna, Patel, & Parmar (2022) and had dominantly positive attitudes towards AI (compare also Baigi, Sarbaz, Ghaddaripouri et al., 2023).

- In all studies, the responding students had no (Ahmed, Bhinder, Tariq et al., 2022; Al Hadithy, Al Lawati, Al-Zadjali, & Al Sinawi, 2023; Al-Qerem, Eberhardt, Jarab et al., 2023; Truong, Vo et al., 2023) or only basic knowledge of AI and its functionalities (Al Saad, Shehadeh, Alanazi et al, 2022; Asmatahasin, Pratap et al., 2021; Baigi, Sarbaz, Ghaddaripouri, et al., 2023; Doumat, Daher, Ghanem, & Khater, 2022; Fernandes, Bafna, Patel, & Parmar, 2022; Keleş & Aydın, 2021; Pinto Dos Santos, Giese, Brodehl et al., 2019; Teng, Singla, Yau et al., 2022; van Hoek, Huber, Leichtle et al., 2019).

- Barriers to their AI knowledge were identified by respondents as lack of knowledge, access, time constraints and curriculum gaps (Al-Qerem, Eberhardt, Jarab, et al. (2023); Doumat, Daher, Ghanem, & Khater, 2022; Fernandes, Bafna, Patel, & Parmar, 2022; Truong, Vo et al., 2023).

- University students predicted that AI technology would impact and benefit their careers within the next decade (Al Hadithy, Al Lawati, Al-Zadjali, & Al Sinawi, 2023; Fernandes, Bafna, Patel, & Parmar, 2022; Teng, Singla, Yau et al, 2023), and they reported a positive outlook on the emerging role of AI in their respective fields (Ahmed, Bhinder, Tariq et al., 2022; Al Saad, Shehadeh, Alanazi et al., 2022; Asmatahasin, Pratap et al., 2021; Teng, Singla, Yau et al., 2022; van Hoek, Huber, Leichtle et al., 2019).

- Summarising the results of these studies, a third of respondents were pessimistic about AI. They believed that the inclusion of AI in education would have negative or even disastrous consequences (e.g. the loss of some cognitive abilities in humans). These respondents were reluctant to use AI both in their current university studies and in their future work.

- In addition, a significant majority (over 75%) of respondents in the aforementioned studies supported the inclusion of AI in their curriculum.

Several studies have mapped the field of general education and elicited the opinions of in-service and pre-service teachers.

Cojean, Brun, Amadieu and Dessus (2023) investigated teachers' attitudes towards educational tools with AI compared to educational tools without AI. Participants had more ethical concerns about AI technologies than technologies without AI, and were more willing to use traditional technologies without AI than AI technologies. The results showed that acceptability was similar for technologies with and without AI; however, technologies with AI were perceived as less burdensome for teachers than traditional tools.

Antonenko & Abramowitz (2022) observed pre-service teachers' (mis)conceptions of AI in K-12 science education in the US. The opinions and attitudes of K-12 teachers were also analysed by Nazaretsky, Cukurova, Ariely, & Alexandron (2021). They surveyed K-12 science teachers who had interacted with various types of AI-based technology. Their findings showed that teachers were reluctant to accept AI-based recommendations if they contradicted their previous knowledge about their students. Strikingly, they expected the AI to be correct in situations where absolute truth may not exist (for example, when grading open-ended questions).

In their research, Chounta, Bardone, Raudsep, & Pedaste (2021) investigated Estonian K-12 teachers' perceptions of AI using the FATE (Fairness, Accountability, Transparency and Ethics) conceptual framework. Their respondents' answers indicated that teachers had limited knowledge about AI and its real potential to support their practice. Nevertheless, they perceived AI as an educational opportunity. The results indicated that teachers needed support to be efficient and effective in their practice.

Similar findings were published by Aljohani (2021) who investigated the opinions and attitudes of EFL teachers and students in Saudi Arabia. The results of this study showed that the respondents had a positive attitude towards the use of AI in learning English as a foreign language.

Álvarez-Herrero (2024) asked Spanish teachers about their opinions on AI and its use in the classroom. The author found that Spanish teachers needed more knowledge about AI and how to implement it in the classroom. Teachers themselves saw more opportunities for improving teacher professional development than for improving teaching-learning processes. Finally, the paper highlights the conclusion that the possible implementation of AI in education requires a critical reflection on the ethics and pedagogical functionalities of AI.

Zhang, et al (2023) focused on identifying the factors that determine pre-service teachers' acceptance of AI technology. They found that perceived usefulness and perceived ease of use were the most important factors influencing pre-service teachers' intention to use AI technology. The authors also highlighted the weak link between theoretical and pedagogical perspectives and the practical application of AI in the classroom. They also noted (along with Zawacki-Richter et al., 2019) that ethical and pedagogical approaches to AI are still at an exploratory stage and need to be addressed soon.

In the context of numerous studies that reported generally positive attitudes towards AI, the research findings published by Haseski (2019), who found that pre-service teachers had predominantly negative emotions in relation to AI, were very different. Here, pre-service teachers stated that they mostly felt fear and concern about artificial intelligence and that they did not want to live in a world with artificial intelligence. Respondents in this study recognised that AI would bring benefits in health, technology and science, make life easier and solve complex problems. They also identified various AI-related risk factors, such as breaches of confidentiality, health risks, potential misbehaviour, environmental damage, security risks and that AI would destroy humans. The potential risks of AI were relatively more pronounced by the participants compared to the potential benefits. In summary, pre-service teachers believed that the most significant negative impact of AI on education would be the possible destruction of the teaching profession.

These studies included student opinions from many countries, including Canada (Teng, Singla, Yau et al., 2022); Germany (Pinto Dos Santos, Giese, Brodehl et al., 2019); India (Asmatahasin, Pratap et al., 2021; Fernandes, Bafna, Patel, Parmar, 2022); Jordan (Al-Qerem, Eberhardt, Jarab, et al., 2023; Al Saad, Shehadeh, Alanazi et al., 2022); Lebanon (Doumat, Daher, Ghanem, & Khater, 2022); Oman (Al Hadithy, Al Lawati, Al-Zadjali, & Al Sinawi, 2023); Pakistan (Ahmed, Bhinder, Tariq et al., 2022); Saudi Arabia (Aljohani, 2021); Switzerland (van Hoek, Huber, Leichtle, et al., 2019), Syria (Baigi, Sarbaz, Ghaddaripouri, K., et al., 2023), Turkey (Haseski, 2019; Keleş & Aydın, 2021), United States (Park, Yi, & Siegel, 2021) and Vietnam (Truong, Vo, et al., 2023). However, no research has been conducted among university students or pre-service EFL teachers in Central Europe. The present paper aims to fill this gap in educational research knowledge, as knowing teachers' and teacher students' attitudes towards AI may be an important factor in the success or failure of AI application in education.

## 2 Research
### 2.1 Objectives and research questions
The main purposes of this research are

1) to assess the perceptions and attitudes towards AI among pre-service EFL teachers in Slovakia and

2) to determine their opinions about the integration of AI into their field of study and university curriculum. T

his research is intended to be a pilot study, which will be followed by a complex national (i.e. covering the whole of Slovakia) and international survey (the results presented will establish their reference values). No similar surveys have been carried out in Central Europe, so it is not known how future language teachers in this region feel about the use of AI in education, language education and foreign language teaching. Nor is it known how they perceive its possible application in their own studies and professional training. The present study opens the topic with a focus on teacher students in Slovakia.

The paper seeks answers to the following research questions:

RQ1: How do Slovak EFL pre-service teachers evaluate their knowledge of AI?

RQ2: How do Slovak EFL pre-service teachers evaluate their experiences with AI?

RQ3: How do they perceive AI in the classroom?

RQ4: What are their attitudes towards the presence of AI in EFL teaching and learning?

### 2.2   Method
Almost all of the aforementioned studies of students' attitudes towards AI used self-developed surveys and unvalidated modified instruments with open-ended questions that were not developed with the intention of being reliable and validated. Several attempts have been made to develop standardised psychological instruments to measure general attitudes towards AI (for more information, see CHTAIS in Bochniarz, Sawicki, & Atroszko, 2021, or GAAIS by Schepman & Rodway, 2022). For students directly involved in AI education, Suh and Ahn (2022) developed and validated a 26-item questionnaire (SATAI) to objectively measure their attitudes towards AI. Due to the different research focus and intended respondent groups, none of these (CHTAIS, GAAIS or SATAI) were suitable for the purposes of this study.

Instead, the author chose a form of knowledge, attitude and practice (KAP) survey that is popular and widely accepted in health sciences. The author modified this form for research in education and teacher training.

KAP surveys are quantitative methods where information is collected via "predefined questions formatted in standardized questionnaires that provide access to quantitative and qualitative information" (Médicins du Monde, 2011). They aim "to elicit what is known (knowledge), believed (attitude), and done (practiced) in the context of the topic of interest" (Andrade, Menon, Ameen, & Praharaj, 2020, p. 478). In addition, KAP surveys "reveal misconceptions of misunderstandings that may represent obstacles to the activities (...) and potential barriers to behavior change" (Médicins du Monde, 2011).

KAP surveys are especially effective in situations "when novel situations arise" or if no surveys have previously been conducted on the defined topic or in the selected population of interest (Andrade, Menon, Ameen, & Praharaj,

2020, p. 478). In that case, they can "establish the baseline (reference value) for use in future assessments and help measure the effectiveness" of education activities (Médicins du Monde, 2011). The results of a KAP survey provide input for the design of future interventions, an effective educational programme or more structured research.

An online self-administered KAP questionnaire was used to collect data for this study. A digital survey instrument (in GoogleForms) was developed by the researcher based on a review of the available literature and then evaluated by two independent experts in educational research.

The research instrument consisted of:
a)  heading (with the explanation of the purpose of the study and informed consent)
b)  demographic details (age, gender, country, study field, previous training in AI),
c)  1 open-ended question and 19 close-ended items structured as 5-points Likert scales. The items elicit responses for 4 categories: knowledge, attitudes – benefits, attitudes – risks, and practice. To minimize any interference, the items in the questionnaire were randomly ordered (not in units according to individual categories):

1.  **Knowledge** (how much do students already know and want to know about AI?) – questionnaire items 3, 4, 7, 11, and 13.
2.  **Positive attitudes** (what benefits of AI do students expect?) – questionnaire items 8, 10, 14, 18, and 19.
3.  **Negative attitudes** (what risks do students relate with AI?) – questionnaire items 9, 12, 15, 16, 17, and 20.
4.  **Practices** (what have already student done or plan to do with AI?) – questionnaire items 1, 2, 5, and 6.

To assess validity, usability, and technical functionality of the survey, it was piloted in October 2022 with a group of pre-service EFL teachers from 3 universities (University of Trnava in Slovakia, Tomas Bata University in Zlin in the Czech Republic and University in Radom in Poland) and refined based on their feedback. The final version of the questionnaire can be seen in Appendix 1.

### 2.3 Respondents

The sample population was selected using a convenience sampling technique, as the research took place at a selected university in Slovakia. Slovakia, as a small EU member state, is still in the early stages of AI adoption and implementation in various areas of economic and social life, including education. The country has adopted the Digital Transformation Strategy 2030 (MIRRI SR, 2019a) and the follow-up Action Plan for Digital Transformation of Slovakia for 2019-2022 (MIRRI SR, 2019b), which propose measures to support AI research and science, the creation of an AI ecosystem, and to help the society use the potential of AI as effectively as possible.

In Slovakia, AI-based tools are already being used in the everyday life of citizens (sometimes without the citizen being aware of it), for example in the initial assessment of a mortgage or loan application. In 2018, Slovakia signed up to the European Coordinated Plan for Artificial Intelligence (European Commission, 2018). In 2019, the Slovak Centre for Artificial Intelligence Research (slovak.AI) will be established to support research and fully exploit the potential of AI. Much attention is being paid to the issue of assessing ethical and socio-legal issues related to the research, development, deployment and use of technologies using AI elements and systems.

Table 1: Student demographics

| Gender | Count (N = 137) | % |
|---|---|---|
| Male | 31 | 22.63% |
| Female | 105 | 76.64% |
| Prefer not to say | 1 | 0.72% |
| **Country you study in:** | Slovakia | 100% |
| **Study field** | | |
| Philology (AjaK) | 0 | 0% |
| Teaching EFL (AJK, AJJ) | 137 | 100% |
| Other | 0 | 0% |
| **Degree** | | |
| Undergraduate (Bc.) | 96 | 70.07% |
| Postgraduate (Mgr.) | 41 | 29.93% |
| Other | 0 | 0% |
| **Previous training in AI** | | |
| Yes | 14 | 10.22% |
| No | 123 | 89.78% |

Invitations to participate with a link to the questionnaire were sent to students at the selected university enrolled in two programmes: 1) teaching English language and literature (pre-service teachers) and 2) philological

programmes in English language and Anglophone cultures (non-teachers), via the university's email services and social media accounts (Facebook, X and Messenger). Responses were open from 1 November 2022 to 31 December 2022. Only completed questionnaires and responses from pre-service EFL teachers were considered for this study (exclusion criteria were a) incomplete questionnaires and b) respondents who were not pre-service EFL teachers).

A total of 137 responses were included in the study (105 from female and 32 from male students; a mean age was 21.44 ± 2.03 years).

At this initial stage of the research and for the purposes of this study, the research sample was treated as a homogeneous unit. No variations and derivations were identified and therefore no complex statistical methods were required for this paper.

### 2.4 Limitations
The main limitation is the small sample size. This, together with the use of a convenience sample, significantly limits the generalisability of the results to the population. Therefore, the investigator did not attempt to formulate generalised conclusions.

### 2.5 Ethical approval
The study was conducted in full compliance with the tenets of the Declaration of Helsinki. Institutional Review Board approval was not required as no vulnerable subjects or groups were involved as respondents and no personal information was collected or stored. The participants were adult university students. Their participation was voluntary and unrelated to their curricular activities. Respondents were informed of the nature and purpose of the questionnaire (in its heading). The privacy and anonymity of the respondents was guaranteed as the research tool did not collect names or emails so that the participant could not be traced.

The collected data were stored and adequately protected in the digital systems of the University of Trnava for the necessary time. Access to the collected data was granted to the researcher only through personal login.

### 3 Results
The analysis of the data collected follows the internal logic of the research tool, which is divided into 4 areas:

### 3.1 Knowledge of AI
When asked about their understanding of the computational principles of AI, 84 EFL pre-service teachers who participated in the survey (61.31%) admitted that they had no understanding. Even more students (87 students = 63.50%) admitted that they had no understanding of the limitations of AI. 29 EFL students (21.17%) rated their knowledge (understanding) of AI computing principles as unsatisfactory. 15 respondents stated that they understood AI principles (satisfactory + very good knowledge), of which only 11 students (8.03%) considered their knowledge to be very good. A very similar number of respondents (13 students = 9.349%) said they also understood the limitations of AI. Unsurprisingly, the responses to items 3 and 4 were consistent.

The responses in item 7 showed that EFL pre-service teachers were equally interested (53 students = 38.68%) and not interested (54 students = 39.42%) in the ongoing discussion about AI in education. Only 11.68% of the respondents were very interested in the topic.

In question 11, a cumulative total of 88 respondents (64.24%) agreed that AI education should be included in the university curriculum. Of these, 37 students (27.01%) strongly agreed with the statement. On the contrary, a total of 23 students (16.79%) disagreed with the statement, of whom 12 (8.76%) strongly disagreed.

In item 13 the students self-assessed their knowledge of intelligent applications for language learning. More students (62 cumulatively =45.25%) considered their knowledge to be inadequate, in contrast to a total of 48 students (35.04%) who agreed with the statement that their knowledge of intelligent tools is adequate. 13 students (11.68%) strongly agreed with the statement.

A summary of the responses analysed for items 3, 4, 7, 11 and 13 are shown in Table 1.

### 3.2 Positive attitudes towards AI
The EFL pre-service teachers had predominantly positive expectations about AI and its application in education and in EFL education specifically. In item 8, a total of 87 students (63.50%) agreed with the statement that AI would improve education in general, compared to 26 students (18.98%) who disagreed. Respondents were even more optimistic when asked about the impact of AI on the teaching and learning of English as a foreign language. A total of 94 students (68.61%) expected it to have a positive impact. Only 18 students (13.19%) expressed the opposite view.

Tab. 2: Count and percent of responses to the items in category "Knowledge"

| Items | | NK | | US | | A | | G | | VG | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | f | % | F | % | f | % | F | % | F | % |
| 3 | How would you assess your understanding of basic computational principles of AI? | 84 | 61.31 | 29 | 21.17 | 9 | 6.57 | 4 | 2.92 | 11 | 8.03 |
| 4 | How would you assess your understanding of the limitations of artificial intelligence? | 87 | 63.50 | 26 | 18.98 | 11 | 8.03 | 4 | 2.92 | 9 | 6.57 |

**Legend:** NK = no knowledge, US = unsatisfying, A = average, G = good, VG = very good

| Items | | NI | | MI | | N | | I | | VI | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | % | f | % | f | % | F | % | F | % |
| 7 | Are you interested in the ongoing discussion about AI in education? | 22 | 16.06 | 32 | 23.36 | 30 | 21.90 | 37 | 27.01 | 16 | 11.68 |

**Legend:** NI = not interested, MI = moderately interested, N = neutral, I = interested, VI = very interested

| Items | | SD | | D | | NS | | A | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | f | % | F | % | f | % |
| 11 | AI education should be included in my curriculum at the university. | 12 | 8.76 | 11 | 8.03 | 23 | 16.79 | 51 | 37.23 | 37 | 27.01 |
| 13 | You have an adequate knowledge of AI-based applications for EFL learning/teaching. | 19 | 13.87 | 43 | 31.39 | 31 | 22.63 | 32 | 23.36 | 16 | 11.68 |

**Legend:** SD = strongly disagree, D = disagree, NS = not sure, A = agree, SA = strongly agree

Tab. 3: Count and percent of responses to the items in category "Attitudes - positive"

| Items | | SD | | D | | NS | | A | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | f | % | F | % | f | % | f | % | F | % |
| 8 | AI will improve education in general. | 8 | 5.84 | 18 | 13.14 | 24 | 17.52 | 47 | 34.31 | 40 | 29.20 |
| 10 | AI will improve learning/teaching EFL. | 9 | 6.57 | 9 | 6.57 | 25 | 18.25 | 56 | 40.88 | 38 | 27.74 |
| 14 | AI will help EFL teachers to make their assessment procedures more objective. | 10 | 7.30 | 21 | 15.33 | 34 | 24.82 | 43 | 31.38 | 29 | 21.17 |
| 18 | AI implementation will reduce the teachers´ workload. | 12 | 8.76 | 26 | 18.98 | 32 | 23.36 | 41 | 29.93 | 26 | 18.98 |
| 19 | AI will help EFL teachers with performing repetitive tasks (such as pronunciation drills). | 14 | 10.22 | 33 | 24.09 | 26 | 18.98 | 34 | 24.82 | 30 | 21.89 |

**Legend:** SD = strongly disagree, D = disagree, NS = not sure, A = agree, SA = strongly agree

Similar levels of respondents' optimism were found when they were asked about the expected impact of AI on some specific teachers' activities, such as assessment procedures and repetitive activities (e.g. pronunciation drills). The majority of the students (72 =52.55%) agreed with the statement in item 14 that AI would help EFL teachers to make their assessment procedures more objective. In item 19, 64 (46.71%) students expected that AI would help EFL teachers to perform repetitive tasks such as pronunciation drills. The respective groups of disagreeing students were considerably smaller - 31 students (22.63%) disagreed with statement 14 and 47 students (34.30%) disagreed with the statement in item 19.

In addition, almost half of the students (a total of 67 = 48.90) agreed with the idea that AI implementation would reduce teacher workload, compared to 38 students (27.74%) who disagreed.

### 3.3 Negative attitudes towards AI

According to their responses, EFL pre-service teachers do not seem to be concerned about the future of their profession in the world with AI. When asked about the possibility of AI replacing human EFL teachers (item 9), only 2 students (1.46%) agreed and none strongly agreed. 31 students (22.63%) were unsure. More than three quarters of the respondents (cumulatively 104 students =75.91%) disagreed, of whom 71 students (51.82%) strongly disagreed.

However, the majority of students (73 =53.28%) agreed with the statement in item 15 that EFL teachers might lose some of their skills when using AI in their practice. This may be one of the reasons why the vast majority of students (cumulatively 92 =67.15%) also agreed with the statement that teachers should be careful when using AI tools in their classrooms (item 12). On the contrary, only 22 students (16.06%) disagreed with item 15 and 14 students (10.22%) disagreed with item 12.

In item 16, more students (a total of 58 = 42.33%) agreed with the statement that AI would make EFL education less personal than disagreed (a total of 31 = 22.63%). 48 students were not sure, which is the highest level of uncertainty of all.

Relatively even results were documented when assessing the statement "AI will be another burden in EFL teachers´ workload" in item 17. Cumulatively 62 students (45.25%) disagreed and 61 (44.52%) agreed. These results are consistent with responses to item 18 where 67 students (48.90%) agreed with the idea that AI implementation would reduce teachers´ workload.

To conclude this category, more than half of the students (a total of 71 = 51.82%) agreed with the statement that AI will become a threat to humanity, which is significantly more than the 34 students (a total of 24.82%) who disagreed.

Tab. 4: Count and percent of responses to the items in category "Attitudes - negative"

| Items | | SD | | D | | NS | | A | | SA | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | % | F | % | f | % | f | % | f | % |
| 9 | AI can replace human EFL teachers. | 71 | 51.82 | 33 | 24.09 | 31 | 22.63 | 2 | 1.46 | 0 | 0.00 |
| 12 | Teachers should be careful when using AI tools in their classes. | 0 | 0.00 | 14 | 10.22 | 31 | 8.03 | 56 | 40.88 | 36 | 26.28 |
| 15 | EFL teachers may lose some of their skills when applying AI in their practice. | 8 | 5.84 | 14 | 10.22 | 42 | 30.66 | 61 | 44.52 | 12 | 8.76 |
| 16 | AI will make EFL education less personal. | 15 | 10.95 | 16 | 11.68 | 48 | 35.04 | 26 | 18.98 | 32 | 23.36 |
| 17 | AI will be another burden in EFL teachers´ workload. | 24 | 17.52 | 38 | 27.74 | 14 | 10.22 | 37 | 27.01 | 24 | 17.52 |
| 20 | AI will become a threat to humankind. | 15 | 10.95 | 19 | 13.87 | 32 | 23.36 | 39 | 28.47 | 32 | 23.36 |
| **Legend:** SD = strongly disagree, D = disagree, NS = not sure, A = agree, SA = strongly agree | | | | | | | | | | | |

### 3.3 Practices of AI

When asked about their practical experience with AI, 54 students (39.42%) stated that they come into contact with AI every day. 28 students (20.44%) use it frequently. Only 6 students (4.38%) were not aware of their contacts with AI in their lives. Even more students (17 students =12.41%) stated they did not encounter AI tools in their study.

On the contrary, 26 students (18.98%) responded that they encountered AI tools in their study at the university every day and 43 students (31.39%) come into contact with AI tools in their study frequently.

In item 5, 25 students (18.25%) stated they had no experience with AI-powered applications for EFL learning/teaching. 27 students (19.71%) assessed their experience as unsatisfying. 37 students (27.01%) self-assessed their experience as good and only 29 students (21.17%) saw their experience as very good.

Tab. 5: Count and percent of responses to the items in category "Practices"

| | Items | N | | R | | S | | F | | ED | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | f | % | f | % | F | % | f | % | F | % |
| 1 | How often are you in contact with AI in your life? | 6 | 4.38 | 15 | 10.95 | 34 | 24.82 | 28 | 20.44 | 54 | 39.42 |
| 2 | How often do you encounter AI tools when studying at the university? | 17 | 12.41 | 21 | 15.33 | 30 | 21.90 | 43 | 31.39 | 26 | 18.98 |
| **Legend**: N = never, R = rarely, S = sometimes, F = frequently, ED = everyday | | | | | | | | | | | |
| | Items | NE | | US | | A | | G | | VG | |
| | | f | % | f | % | F | % | f | % | F | % |
| 5 | How do you assess your experience with AI-based applications for EFL learning/teaching? | 25 | 18.25 | 27 | 19.71 | 19 | 13.87 | 37 | 27.01 | 29 | 21.17 |
| **Legend:** NE = no experience, US = unsatisfying, A = adequate, G = good, VG = very good | | | | | | | | | | | |

When asked in open-ended item 5 to name some AI applications they use for EFL learning/teaching, students provided 305 responses (in average 2.23 applications given by one respondent). For this item, 14 students did not give any response (the minimum value); one respondent provided a list of 11 applications (the maximum value).

### Conclusions and discussion

After analysing the newly collected data, the current study came to the following conclusions:

*RQ1: How do Slovak EFL pre-service teachers evaluate their knowledge of AI?*

Although almost all Slovak EFL pre-service teachers reported using AI tools in their everyday life and university studies, they also reported no (61.31%) or unsatisfactory knowledge (21.17%). These results were confirmed by the reported total lack of understanding (63.50%) or poor knowledge (18.98%) of the limitations of AI. These results are consistent with those published in previous studies on the knowledge of AI among teachers or pre-service teachers (Álvarez-Herrero, 2024; Chounta, Bardone, Raudsep, & Pedaste (2021) or university students from other disciplines (Ahmed, Bhinder, Tariq et al., 2022; Al Hadithy, Al Lawati, Al-Zadjali, & Al Sinawi, 2023; Al-Qerem, Eberhardt, Jarab et al, 2023; Truong, Vo et al., 2023; Al Saad, Shehadeh, Alanazi et al., 2022; Asmatahasin, Pratap et al., 2021; Baigi, Sarbaz, Ghaddaripouri, et al. 2023; Doumat, Daher, Ghanem, & Khater, 2022; Fernandes, Bafna, Patel, & Parmar, 2022; Keleş & Aydın, 2021; Pinto Dos Santos, Giese, Brodehl et al. 2019; Teng, Singla, Yau et al. 2022; van Hoek, Huber, Leichtle et al. 2019).

On the other hand, respondents rated their knowledge of AI-based applications for EFL teaching significantly higher. A total of 48 students (=35.04%) agreed that they had adequate knowledge of these applications. However, almost half of the students (45.25%) tended to disagree and rated their knowledge as inadequate. It was therefore encouraging to learn that a total of 64.24% of respondents agreed that AI training should be included in the university curriculum, i.e. they would like to receive more training focusing on artificial intelligence in EFL. This is another result that links the attitudes of Slovak pre-service teachers with the results of similar studies from other countries (Álvarez-Herrero, 2024; Ahmed, Bhinder, Tariq et al., 2022; Al Hadithy, Al Lawati, Al-Zadjali, & Al Sinawi, 2023; Al-Qerem, Eberhardt, Jarab et al, 2022; Asmatahasin, Pratap et al., 2021; Baigi, Sarbaz, Ghaddaripouri, et al. 2023; Chounta, Bardone, Raudsep, & Pedaste, 2021; Doumat, Daher, Ghanem, & Khater, 2022; Fernandes, Bafna, Patel, & Parmar, 2022; Keleş & Aydın, 2021; Pinto Dos Santos, Giese, Brodehl et al., 2019; Teng, Singla, Yau et al., 2022; van Hoek, Huber, Leichtle et al., 2019).

*RQ2: How do Slovak EFL pre-service teachers evaluate their experience with AI for EFL?*

When responding to the items related to RQ2, an equal number of groups of respondents rated their experience with AI as very good (21.17%) and good (27.01%) compared to those students (19.71%) who said their experience

was unsatisfactory or those (18.25%) who believed they had no experience with AI-based applications for EFL learning/teaching. When asked to name some of the applications, the respondents gave an average of 2.33 responses, and in total produced a list of 17 applications.

*RQ3: How do Slovak EFL pre-service teachers perceive AI in education?*

Slovak EFL pre-service teachers had predominantly positive expectations of AI and its application in education. Cumulatively, 63.50% of them agreed with the statement that AI would improve education in general (compared to only 18.98% who disagreed). In this respect, the results of the current study were similar to the results of many research studies in which their respondents believed that AI would have a positive impact on future practices in education (Akgun & Greenhow, 2022; Aljohani, 2021; Antonenko & Abramowitz, 2022; Bryant, Heitz, Sanghvi, & Wagle, 2020; Bosch, Marenet, Job et al., 2023; Chounta, Bardone, Raudsep, & Pedaste, 2021; Ghotbi, Ho, & Mantello, 2022; Keleş & Aydın, 2021; Williams, 2015; Zawacki-Richter, Marín, Bond, & Gouverneur, 2019; Zhang & Dafoe, 2019; Zhang et al., 2023).

*RQ4: What are their attitudes towards presence of AI in EFL teaching and learning?*

In the current study, the participating Slovak EFL pre-service teachers shared predominantly positive attitudes towards the integration of AI in EFL and showed their optimistic expectations regarding the impact of AI on teaching and learning English as a foreign language. These findings are consistent with previous studies by Aljohani (2021). However, previous research studies (Baker, Smith, & Anissa, 2019; Bochniarz et al., 2021; Broadbent, 2017; Fehler, 2017; Fourtané, 2020; Gherhes, 2019; Haggendorff, 2020; Shepman & Rodway, 2020; Wang & Wang, 2019; Zawacki-Richter et al., 2019; Zhang & Dafoe, 2019) that also showed a relatively stable high level of reluctance towards intelligent tools among people regardless of their age, education, social or cultural background. In the current study, Slovak EFL pre-service teachers did not express their concerns about the future of their profession. Instead, the majority of them (53.28% cumulatively) agreed that EFL teachers might lose some of their skills when using AI in their practice and a significant number (42. 33% cumulatively) feared that AI would make EFL teaching less personal, which is consistent with several previously published studies (Akgun & Greenhow, 2022; Álvarez-Herrero, 2024; Bochniarz, Czerwiński, Sawicki, & Atroszko, 2022; Chounta, Bardone, Raudsep, & Pedaste, 2021; Cojean, Brun, Amadieu, & Dessus, 2023; Ghotbi, Ho, & Mantello, 2022; Haseski, 2019; Williams, 2015).

The findings confirmed that it is important to update the EFL teacher training curriculum and improve the training of future EFL teachers in the use of AI-based tools. Universities and other institutions involved in EFL teacher training should organise seminars, lectures and workshops on AI systems that EFL teachers could incorporate as auxiliary tools in their teaching practice. The reported lack of basic information about the computational principles of artificial intelligence might not negatively affect their teaching practice if EFL teachers were able to use them effectively. The issue that needs to be addressed by both research and classroom practice is the ethical issues associated with AI.

**Conflict of interest**

The author of this article declares no relationship with any company whose products or services may be related to the subject matter of this article.

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**Appendix: The questionnaire**

You are being invited to participate in this research study intending to identify attitudes of English as a foreign language (EFL) pre-service teachers and students of English philology towards integrating artificial intelligence (AI) into education and their training. Its completing should take approximately 10 minutes of your time. Please, remember that by sending your responses, you give an implied consent with participation in research. Your participation in research is voluntary[1]. The research is anonymous[2] and collected data will be protected[3].

If you do not wish to take part in the research, close this website address.

Thank you!

Contact to the research supervisor: silvia.pokrivcakova@truni.sk

| **Implied consent** |
|---|
| I have read and understand the information. I agree to take part in the research with the knowledge that I am free to withdraw my participation in the research without penalty. |
|       I agree.               I do not agree. |

Your age:
Your gender:
Country you study in:
Your study field:   philology  / teaching EFL  / other
You study for a degree: undergraduate (Bc.)  / postgraduate (Mgr.)  / other
Have you received previous training in AI:  yes / no

1 How often are you in contact with AI in your ordinary life?
1)  never   2)   rarely   3) sometimes  4) often    5) everyday

2   How often do you encounter AI tools when studying at the university?
1)  never   2)   rarely   3) sometimes  4) often    5) everyday

3   How would you assess your understanding of basic computational principles of AI?
1)  no knowledge   2) unsatisfying   3) average    4) good    5) very good

4   How would you assess your understanding of the limitations of artificial intelligence?
1   no knowledge   2) unsatisfying   3) average    4) good    5) very good

5   How do you assess your experience with AI-powered applications for EFL learning/teaching?
1)  no experience   2) unsatisfying   3) adequate    4) good    5) very good

6 Please, name some AI applications you use for EFL learning/teaching?

7 Are you interested in the ongoing discussion about AI in education?
1) not interested    2) moderately interested    3) neutral    4) interested    5) very interested

8 AI will improve education in general.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

9 AI will replace human teachers of EFL in the future.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

10 AI will improve EFL learning/teaching of EFL.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

11 AI education should be included in my curriculum at the university.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

12 Teachers should be careful when using AI tools in their classes.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

13 You have an adequate knowledge of AI-powered applications for EFL learning/teaching.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

14 AI will help EFL teachers to make their assessment procedures more objective.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

15 EFL teachers may lose some of their skills when applying AI in their practice.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

16 AI will make EFL learning less personal.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

17 AI will be another burden in EFL teachers´ workload.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

18 AI implementation will reduce teachers´ workload.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

19 AI will help EFL teachers with performing repetitive tasks (such as pronunciation drills).
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

20 AI will become a threat to humankind.
1) strongly disagree    2) disagree    3) not sure    4) agree    5) strongly agree

[1] **Your participaton in research is voluntary.**
If you choose to take part now, you may change your mind and withdraw later. If you do not click on the 'submit' button after completing the form, your responses will not be recorded. In addition, you can choose to skip questions that you do not wish to answer. Some questions may make you feel uncomfortable. If that happens, you can skip those questions or withdraw from the study altogether. If you decide to quit at any time before you have finished the questionnaire, your answers will not be recorded. However, once you click the 'submit' button at the end of the form, your responses cannot be withdrawn as we will not know which ones yours are.
There will be no direct benefits to you for taking part in this research and you will not be paid to take part in this study.

[2] **The research is anonymous**. We will use the questionnaire to collect and forward your anonymous responses to us. We will not receive any identifying information (name, address, ID) and you will not be contacted again in the future.

[3] **Collected data will be protected.** Your responses will be downloaded to a secure file that requires a password to access. Responses will be deleted from the file after analysis is complete and study findings are professionally presented or published.