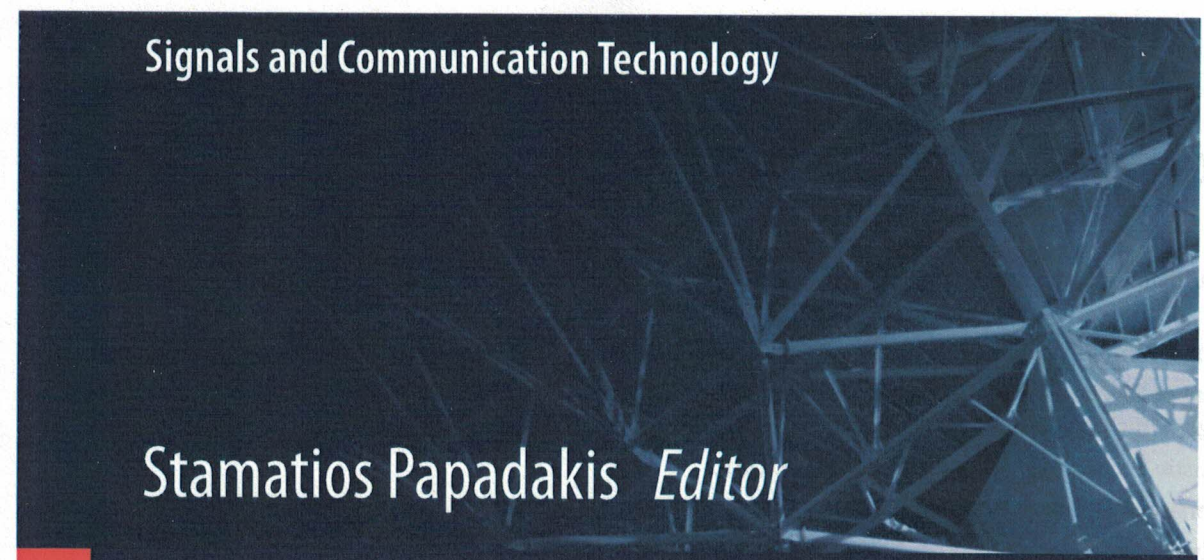
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AI Roles and Responsibilities in Education

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AI Roles and Responsibilities in Education



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Chapter 15
How Future Teachers Perceive Artificial Intelligence?



Milan Kubiatko

Abstract This text is focused on the perception of artificial intelligence by future teachers of the first grade of primary schools. It is one of the most exciting and fast-growing fields. It influences many people in different workplaces. The main aim was to find out the attitudes of future primary school teachers to the artificial intelligence. The research sample consisted of university students in the field of teaching for the first grade of elementary schools. A research tool was divided into three elemental parts. The first part contained the introductory information where the purpose of the research investigation was discussed. The second part included demographic variables such as gender, age, form of study and place of residence. Lastly, the third part was the most extensive and contained a total of 76 Likert-type items. The methods of descriptive, inductive and multivariate statistics were used. It was found that the future teachers of the first grade of elementary schools show a relatively positive perception of artificial intelligence. Furthermore, it was also found that students are interested in the use of artificial intelligence in different areas, both in the work environment and in everyday life, and they assess the inclusion of artificial intelligence education into the curriculum vitae as important.

Keywords Artificial intelligence · ChatGPT · Education · Academic cheating · Future teachers

15.1 Introduction

Artificial intelligence, known as AI, is undergoing great development. It is one of the most exciting and fast-growing fields that have made giant steps in the past 40 years. Although artificial intelligence improves our everyday lives, it is not

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unerring and flawless. It is needed to mention that many popular, opinion-forming and scientific journals showed that nearly 50% of population had or has the experience with artificial intelligence. So the teachers have the opportunity and also responsibility to create and teach how to correctly use artificial intelligence and avoid irresponsible and cheating behaviour. AI is used in education with huge importance; some important facts are as follows: three in five (60%) teachers claim to have integrated AI into their daily teaching practices; the most common AI tools used in education by teachers are AI-powered educational games, used by more than half (51%) of the teachers, and also around half (51%) of the teachers feel that the use of AI in education will have a positive impact, compared to just over a fifth (21%) who hold negative views.

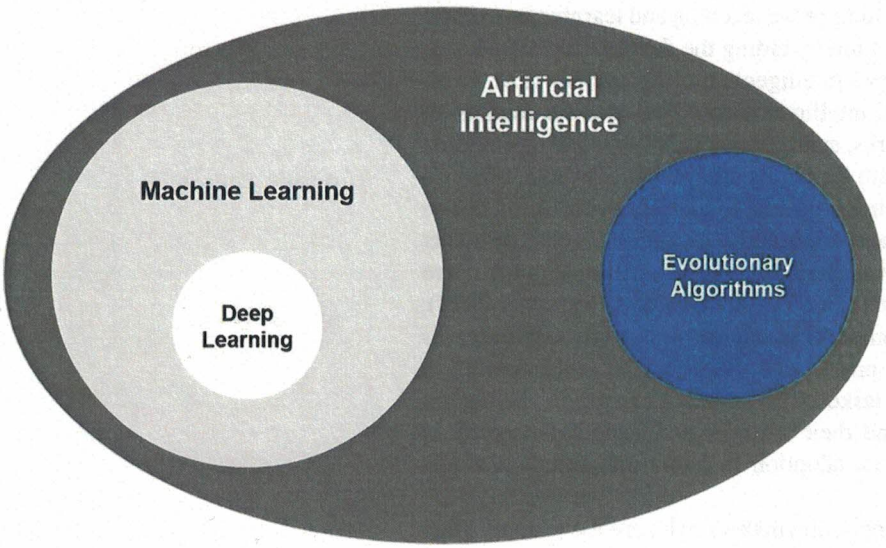
The basic definition is by the esteemed American expert and scientist in the field of artificial intelligence, Marvin Lee Minsky. He defines artificial intelligence as the science of making machines or systems that use such a process when solving a particular task that we would regard as proof of intelligence if done by men (Minsky 1961). In their book "Artificial Intelligence with Uncertainty", Li and Du (2017) define artificial intelligence as a set of various forms of intelligent behaviour and mental activities that can be performed artificially through real activities, including the ability to perceive, memorise, justify, logically and creatively consider, identify, understand, communicate and suggest as well as the ability to learn and adapt to new information and situations. In similar conditions, the definition of artificial intelligence was presented in the study of Hwang and Chien (2022) or Gutierrez et al. (2023).

The study focused on the perception of artificial intelligence by future teachers. This group of people is important due to their future work. Because they will influence children, pupils and adolescents by their approach toward using of modern technologies, their perception of artificial intelligence could hint how it will be used during the education process. The main aim was to find the attitudes that pre-service primary school teachers have to using artificial intelligence.

15.2 Artificial Intelligence: Technical Aspects, Perspectives and ChatGPT

15.2.1 Technical Aspects of AI

Artificial intelligence is often described as computer-based systems that are developed to imitate human behaviour. Artificial intelligence covers machine learning, evolutionary algorithms and other technologies like rule-based systems. The fact is that the presence of different subfields often overlaps, and the delineation determination is difficult. For the better holistic understanding of AI, the brief characteristic of machine learning, evolutionary algorithms and their connection is presented in the next lines. Machine learning is currently the subfield of artificial intelligence,



Picture 15.1 Technical aspects of artificial intelligence (Drexl et al. 2019)

which is used very often in this concept. It deals with teaching a computer program to identify patterns in data and to apply the knowledge to new data (Rodrigues et al. 2021; Shamir and Levin 2022). An evolutionary algorithm is an optimisation method that attempts to identify the best solution for a given problem out of multiple, autonomously generated alternatives (Eiben and Smit 2011). Another subfield is deep learning, which is characterised as a subset of the machine learning algorithms, which aim at discovering multiple levels of distributed representations (Guo et al. 2016). For the better understanding of technical aspects, see Picture 15.1.

Algorithms are sets of rules that define sequences of instructions to perform tasks such as solving a problem (Kearns and Roth 2019). Algorithmic bias refers to errors in AI systems that lead to inequitable outcomes for different groups (Russell and Norvig 2021). However, algorithmic bias can also be seen as a function of how technology and society are mutually constitutive; societal relations influence how technologies are shaped, while technologies in turn influence which societal interactions are possible (Kelan 2024).

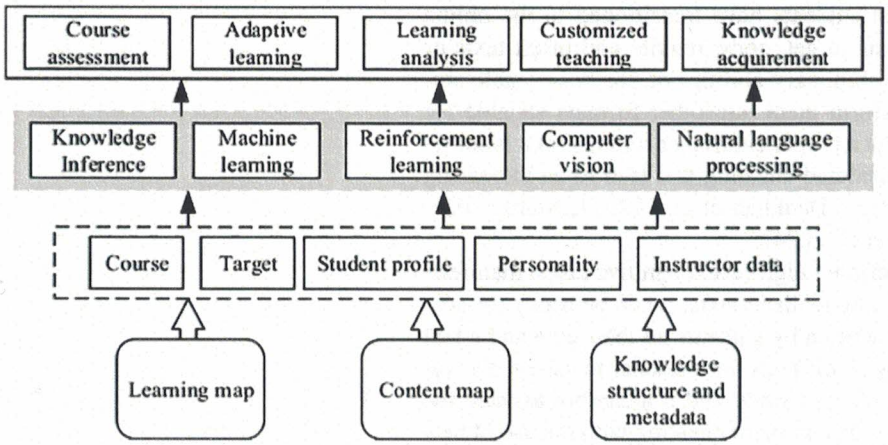
15.2.2 Perspectives of Artificial Intelligence for Stakeholders

Artificial intelligence has an effect on every social group. However, the chapter is focused on the problematic of future teachers, so in the next lines are presented perspectives of artificial intelligence for the related profession. Artificial intelligence has become increasingly important in education, if we talk about in-service teachers, as it has the potential to revolutionise teacher training programs by

providing new tools and resources that can improve teaching and learning outcomes. AI has significantly contributed to education by aiding the development of personalised learning, adaptive assessment and intelligent tutoring system (Lee et al. 2024). For in-service teachers, artificial intelligence could be used for rephrasing texts, generating concepts and frameworks, synthesising information and providing additional capabilities to detect plagiarism for pupils' and students' works, to monitor students' performance in their learning progress, to identify unclearness in students' learning processes to address them from early education levels, to predict pupils' and students' likelihood of early dropout and also to perform administrative duties more quickly (Galindo-Domínguez et al. 2024; Sun and Hoelscher 2023). However, the successful implementation of AI in education lies in the willingness and readiness of teachers, particularly pre-service teachers who are preparing to enter the field. Pre-service teachers are tasked with adapting to evolving pedagogical practices and technology trends, and their attitudes and intentions toward AI integration will significantly influence its adoption in future classrooms (Zakaria and Hashim 2024).

Next important profession is education policymakers, who are the primary gatekeepers as they are highly influential in determining subjects that are implemented in schools. Education policymakers are saddled with the responsibility of creating innovative and sustainable policies, including learning environments, that support effective teaching and learning (Huang and Asghar 2016). In the context of AI education as a new subject for K-12 levels, the views of policymakers matter since they provide directives and draw up guidelines for school curricula materials (Sanusi et al. 2024a). AI systems are also used for the quality assurance of curricula and the associated didactic arrangements and to support teachers. For example, graph network analysis is applied to identify study patterns that supported redesigning learning tasks, materials and assessments (Ifenthaler et al. 2024). Another potential benefit of using AI is that it assists educational leaders' data-informed decision-making. Potential perils of AI in educational leaders' data-informed decision-making are given from three aspects. I conclude this position study by offering recommendations for educational leaders who are interested in applying AI to assist their data-informed decision-making (Wang 2021).

Developers have more extensive computer science knowledge and skills for the implementation of artificial intelligence. Developers should have the ability to quickly understand and apply new architectures as they continue to be developed; recently, transformers have revolutionised language models and required many developers to pivot their attention accordingly (Thirunavukarasu et al. 2023). Developers may also be comfortable leveraging adjacent and emerging technologies to ideate and implement novel applications for educational process (Nguyen et al. 2023). Developers may undertake critical appraisal of primary computer science research as reported in preprints and conference papers, perhaps evaluating reproducibility using provided source code. Developers may leverage the newest techniques and technologies to produce novel clinical applications, driving innovation forward (Turzo and Bosu 2024).



Picture 15.2 Technological structure of artificial intelligence in education (Chen et al. 2020)

It is important to mention that the artificial intelligence in this chapter is focused on educational process, so Picture 15.2 presents the technological structure of artificial intelligence in the education process.

15.2.3 ChatGPT

With the arrival of artificial intelligence that can learn from us and communicate with us using our ordinary language, people have set out to explore a new, courageous future. Interaction between people and artificial intelligence is gaining popularity worldwide, and "chatting robots" are also becoming trendy in the Czech lands. ChatGPT, "Chat Generative Pre-trained Transformer" in full, is a name for a high-performance computer program capable of generating a comprehensive, coherent and relevant text. Its task is to understand what people say and generate answers. It is based on the deep neural model of learning called GPT-3. When asked, it can analyse your question and generate an answer based on what it has learnt from many text data previously recorded in its memory. It is needed to say that its memory reaches only up to 2021; therefore, it cannot answer questions about what has happened since that time or what is currently happening (e.g. Rajaraman 2023). Chatbots have become a multifunctional tool that can be used for a wide range of activities—from aiding and support in education, research and data analysis to improving customer support and creating marketing content. Its unique abilities bring an innovative approach to many disciplines and promise further advancement and development in the area of artificial intelligence (Luo et al. 2022).

The recent rise and general users' awareness of artificial intelligence have raised many considerations and discussions regarding ethics and its potential misuse, chiefly at the tertiary education level. Owing to its easy availability and the

incredible amount of information, most students have transitioned to the online world. It is not very difficult for students to get, copy, rewrite and insert texts or thoughts from various sources. The revolutionary abilities of chatbots enable students to generate full papers and transform them into other formats suitable for academic purposes. Nevertheless, without a proper citation or stating that it is someone else's paper, such practices are considered cheating and lead to an increasing number of plagiarism cases (Anders 2023; Dadkhah et al. 2023; Edwards 2023; Hutson 2024; Jarrah et al. 2023; Taloni et al. 2024).

Because AI tools are capable of performing high-level cognitive tasks, manifesting skills of critical thinking and producing realistic texts, it can be tricky for academic staff to recognise between a text written by students on their own and a text generated by a chatbot; similarly, it may be difficult for a teacher to assess if a student fully understands the presented content to study and if a chatbot assisted the student to answer the teacher's questions. The issue of cheating with the use of new technologies provokes new ethical questions; therefore, programmers focus on developing tools and strategies to reduce the risks of cheating, such as tools to detect plagiarism. These instruments can analyse the language structure and style of the given paper and identify any anomalies that are typical, for example, when using ChatGPT or other language models of AI. Chatbots may tend to produce texts that include repeatedly occurring phrases or use weird and inconsistent language (Baker et al. 2023; Rese and Tränkner 2024; Xia 2023).

15.3 Current State of Literature

This chapter includes selected and important research studies regarding the using and perception of artificial intelligence among adequate research samples. Baidoo-Anu and Ansah (2023) conducted a survey to provide an overview of how generative artificial intelligence may influence educational processes, including potential benefits and risks. The study proved that, despite its limits, generative artificial intelligence will remain a revolutionary element of the educational system. The study warns that other generative models of artificial intelligence are powerful tools, but they are not to substitute human teachers; it is essential to use these tools in a responsible way and under the leadership and support of a human. Sanusi et al. (2024b) examined the influence of different factors on the perception of artificial intelligence by pre-service teachers. As per the presented findings of this research, it is possible to say that pre-service teachers did not have problems with artificial intelligence, and gender did not have any influence on this perception. And it is an important point that every teacher is confident that artificial intelligence has an influence on the educational process in a positive or negative way. It is caused by the relatively new concept, artificial intelligence, and many future teachers have doubts about the possibilities of artificial intelligence in the educational process. Similar findings were possible to find in other studies (e.g. Hsu et al. 2024; Lim 2023, 2024). These studies are examples of a quantitative approach toward obtaining and

analysing data, which could be useful for further researchers, who are interested in this problematic. It is possible to find methods on how to analyse data and create conclusions regarding the perception of artificial intelligence by different people.

Other authors state similar findings about artificial intelligence, for example, Haseski (2019), whose survey respondents also involved future teachers. Employing a semi-structured dialogue, the researcher identified the positives and negatives associated with the use of artificial intelligence. The conclusions are the same as those of the above-listed studies. Kanaan (2022) summarised his findings and said that future teachers, chiefly of natural science subjects, see the potential of artificial intelligence in searching for their future employment, where artificial intelligence can help through dialogues to succeed in job interviews. Similar results to those listed above can be found in other scientific surveys (e.g. An et al. 2023; Celik 2023; Gelacio et al. 2024; Hijón-Neira et al. 2023; Nja et al. 2023; Oubibi 2024; Sanusi et al. 2022; Yang and Chen 2023; Zawacki-Richter et al. 2019). Some authors also focused on some demographical variables, which can influence the attitudes to artificial intelligence. The gender is one of the often-examined variables. The majority of studies found out that men and boys have more positive attitudes toward artificial intelligence (Kim and Lee 2024; Kolar et al. 2024; O'Shaughnessy et al. 2023). It is possible to see that many studies provided a positive effect of artificial intelligence on the educational process and on the work of educational workers and other staff. However, there are hidden problems with artificial intelligence, with the most important being that many subjects used and use artificial intelligence for non-ethic purposes. This fact is very rarely mentioned in the research studies focused on artificial intelligence. Another thing which is possible to find in the research studies focusing on artificial intelligence is that the research is primarily focused on the use of ChatGPT. Some aspects of artificial intelligence were omitted. Maybe it could be the part of further research studies. However, research studies are focused on artificial intelligence and their using and perception in education process, which could bring a detailed view on various uses of AI.

15.4 Research Aims

The main aim was to find the attitudes of pre-service primary school teachers to using artificial intelligence. After determining the main aim, additional aims were identified:

- To define general attitudes to AI issues
- To spot the differences in how men and women use AI
- To discover how AI is perceived during the educational process
- To consider the use of AI from the point of view of ethics

15.5 Research Methodology

The representative sample included university students in full-time and remote study programs, most of whom were teacher-training students. The total number of participants was 247, of which 194 were women and 53 were men; their average age was 33.36 years. The in-service teachers are a crucial sample, because they are confronted with artificial intelligence during their study. So, their attitudes should be influenced by their study years. Probably, they could recognise the positive and negative effects of artificial intelligence on the educational process in primary or high schools. The variables, which were incorporated into the research, were selected according to research studies presented in the previous subsection and also according to the prediction that part-time job could have an impact on the perception of artificial intelligence. Students, who are working during their study, are often in time pressure, so there is a chance that they find ways to manage their study and work duties. It is possible to find that some variables have already been examined in other countries, such as the Czech Republic. Therefore, there is an opportunity to bring new findings that could support previous results from other countries or reveal different perspectives on the perception of artificial intelligence in the Czech Republic.

The survey instrument was divided into three main parts. The first part included introductory information dealing with the survey's goals. The second part described the demographic variables such as gender, age, field and form of study, residence and part-time job while studying. Respondents could choose their answers from the given options or write a short answer on their own. The last, third part was the most extensive, including 76 items. The items contained statements that the respondents rated with points according to their opinions (the scale's stances were as follows: strongly disagree–disagree–neither agree nor disagree–agree–strongly agree). This part of the survey instrument was taken over from other survey instruments, and its focus was as follows: the first 46 Likert-type items expressed attitudes toward artificial intelligence. The items were divided into two questionnaires. The first questionnaire dealt with general attitudes to artificial intelligence; the original title is "*General Attitudes towards Artificial Intelligence Scale (GAAIS)*". This acronym is used throughout the results section of the final part. The authors of the scale were Schepman and Rodway (2023). The questionnaire included 20 items divided into two dimensions—the first one being positive attitudes while the other one negative attitudes toward AI. The item division was also tested within the data gained in the study and is part of the Data Analysis chapter. The second questionnaire was titled "*Student Attitudes Toward Artificial Intelligence (SATAI)*". This acronym is also used in the results part of the study. The questionnaire was created by Suh and Ahn (2022) and included 26 items. The items were divided into three dimensions: cognitive (4 items), affective (10 items) and behavioural (12 items). All items were phrased positively. The division of the items was also tested within the data gained in the studies, and it is part of the Data Analysis chapter.

Another 10 items were focused on students' self-efficacy. The questionnaire was first used by Hodacova et al. (2020). The items constituted a single-construct model, and all were phrased positively.

The last questionnaire used as a survey instrument dealt with anxious students—the original title is "*State-Trait Anxiety Inventory (STAI)*", created by Spielberger et al. (1968). The anxiety scale included 20 items in short statements; the respondents' task was to assess how they usually feel and mark the degree of their assessment. There were 7 positively and 13 negatively phrased statements. The anxiety scale was a single-construct model. This was the only questionnaire with different rating options on the scale (1—never, 2—exceptionally, 3—sometimes, 4—often, 5—very often).

After collecting the questionnaires, the data were entered into the MS Excel spreadsheet processor and recoded for statistics processing. The answers on the scale were recoded as follows: strongly disagree—1, disagree—2, neither agree nor disagree—3, agree—4, and strongly agree—5. Similarly, it was done with the items on the scale in the anxiety questionnaire: 1—never, 2—exceptionally, 3—sometimes, 4—often, and 5—very often. As stated in Chap. 4, negatively phrased items were coded oppositely. As the first step, the reliability of the survey tool was counted—both the whole and its parts. Reliability was determined by using Cronbach's alpha coefficient (α). The value for the whole survey instrument regarding the attitude to artificial intelligence was $\alpha = 0.96$. This value indicated the high reliability of the survey instrument. Nunnally (1978) stated the critical value for standardised survey instruments to be 0.70, and for non-standardised 0.60. In Table 15.1, reliability values for all other questionnaires are listed, including the individual dimensions, if there are any. When determining the reliability of the individual dimensions listed in Table 15.1, the theoretical model by Christmann and van Aelst (2006) was used; it states that the critical value is $\alpha = 0.50$.

Validity specification was carried out in two ways. The content validity was confirmed in consultations with a pedagogical research methodologist and a Czech-language teacher, who determined if the individual items were suitable and comprehensive for the respondents' age group.

Table 15.1 Values of reliability for every aspect of artificial intelligence instrument

	α
GAAIS	**0.87**
Positive dimension	0.88
Negative dimension	0.81
SATAI	**0.95**
Cognitive dimension	0.67
Affective dimension	0.88
Behavioural dimension	0.93
Self-efficacy	**0.91**
Anxiety	**0.79**

The second type of validation was construct validity; it was assessed because the items in the survey instrument were grouped according to original factors. Tables 15.2 and 15.3 list the division of items of both questionnaires into individual factors. Based on the confirmatory factor analysis (CFA), we can claim that the items were divided according to their original character, preventing the items of the two questionnaires from mixing up. The critical value for the factor score is 0.40, which is a standard value for surveys in socioscientific disciplines, e.g. Luo et al. (2020).

Subsequently, the value of normality was determined through the Kolmogorov-Smirnov test that assessed the distribution of the collected data. The normality test value was determined for each questionnaire used for the survey as well as for every item of both questionnaires. The values point to a standard data distribution for every survey instrument (Table 15.4). Concerning the normality test results, it was possible to use parametric statistic methods.

Table 15.2 Results of factor analysis regarding GAAIS questionnaire

I. Positive dimension	**I**	**II**
1. For routine transactions, I would rather interact with an artificially intelligent system than with a human	**0.49**	0.07
2. Artificial intelligence can provide new economic opportunities for this country	**0.69**	0.00
4. Artificially intelligent systems can help people feel happier	**0.50**	0.22
5. I am impressed by what artificial intelligence can do	**0.66**	0.12
7. I am interested in using artificially intelligent systems in my daily life	**0.65**	0.27
11. Artificial intelligence can have positive impacts on people's well-being	**0.64**	0.12
12. Artificial intelligence is exciting	**0.72**	0.21
13. An artificially intelligent agent would be better than an employee in many routine jobs	**0.68**	−0.13
14. There are many beneficial applications of artificial intelligence	**0.75**	0.05
16. Artificially intelligent systems can perform better than humans	**0.62**	−0.21
17. Much of society will benefit from a future full of artificial intelligence	**0.69**	0.01
18. I would like to use artificial intelligence in my own job	**0.70**	0.27
II. Negative dimension		
3. Organisations use artificial intelligence unethically	0.01	**0.49**
6. I think artificially intelligent systems make many errors	−0.05	**0.53**
8. I find artificial intelligence sinister	0.30	**0.64**
9. Artificial intelligence might take control of people	0.06	**0.77**
10. I think artificial intelligence is dangerous	0.07	**0.83**
15. I shiver with discomfort when I think about future uses of artificial intelligence	0.15	**0.77**
19. People like me will suffer if artificial intelligence is used more and more	0.34	**0.59**
20. Artificial intelligence is used to spy on people	0.02	**0.60**
Eigenvalues	***6.19***	***2.95***
% of variance	***30.95***	***14.74***

Numbers of items are identical with the research tool

Table 15.3 Results of factor analysis regarding SATAI questionnaire

I. Cognitive dimension	**I**	**II**	**III**
21. I think that it is important to learn about AI in school	**0.84**	0.12	0.01
22. AI class is important	**0.87**	0.02	0.12
23. I think that lessons about AI should be taught in school	**0.89**	−0.12	0.03
24. I think every student should learn about AI in school	**0.85**	0.05	0.11
II. Affective dimension			
25. AI is very important for developing society	−0.10	**0.90**	0.06
26. I think AI makes people's lives more convenient	0.01	**0.85**	0.05
27. AI is related to my life	0.07	**0.91**	−0.08
28. I will use AI to solve problems in daily life	0.03	**0.93**	−0.04
29. AI helps me solve problems in real life	0.02	**0.92**	0.10
30. I will need AI in my life in the future	0.07	**0.93**	−0.06
31. AI is necessary for everyone	0.00	**0.91**	0.03
32. AI produces more good than bad	0.02	**0.94**	−0.10
33. AI is worth studying	0.09	**0.93**	0.05
34. I think that most jobs in the future will require knowledge related to AI	0.00	**0.93**	−0.09
III. Behavioural dimension			
35. I want to work in the field of AI	0.01	0.04	**0.95**
36. I will choose a job in the field of AI	0.08	0.01	**0.94**
37. I would participate in a club related to AI if there was one	−0.03	0.07	**0.94**
38. I like using objects related to AI	−0.06	0.04	**0.95**
39. It is fun to learn about AI	0.02	−0.04	**0.97**
40. I want to continue learning about AI	0.08	−0.03	**0.95**
41. I am interested in AI-related TV programs or online videos	−0.01	0.08	**0.96**
42. I want to make something that makes human life more convenient through AI	0.02	0.02	**0.96**
43. I am interested in the development of AI	0.05	−0.09	**0.93**
44. It is interesting to use AI	0.03	−0.03	**0.96**
45. I think that there should be more class time devoted to AI in school	−0.07	−0.05	**0.96**
46. I think I can handle AI well	0.04	−0.04	**0.96**
Eigenvalues	***7.22***	***4.13***	***2.95***
% of variance	***30.95***	***20.53***	***14.74***

Numbers of items are identical with the research tool

Table 15.4 Values of normality for every aspect of artificial intelligence instrument

	d	*p*
Attitudes to AI	**0.07**	**>0.20**
GAAIS	**0.05**	**>0.20**
Positive dimension	0.07	>0.10
Negative dimension	0.07	>0.10
SATAI	**0.04**	**>0.20**
Cognitive dimension	0.08	>0.05
Affective dimension	0.06	>0.20
Behavioural dimension	0.04	>0.20

Due to the data character and the goals to be met, methods of parametric statistics were used. In addition to descriptive methods such as average, methods of inductive statistics were used, namely Student's *t*-test for free choices (*t*), where the independent variables were sex, form and field of study, residence and part-time job while studying. Other independent variables had an interval or ratio character. Pearson correlation coefficient (*r*) was used to identify the correlations. The results were assessed according to the significance level $p < 0.05$, $p < 0.01$ and $p < 0.001$. The data were analysed using SPSS 25.0 and STATISTICA 10.0 Microsoft Excel 365 programs.

15.6 Results

The overall score regarding the perception of artificial intelligence was $x = 3.02$ (SD = 0.68), which demonstrated neutral perception of artificial intelligence by pre-service teachers. Figure 15.1 showed distribution of score in the two scales. The difference between two scales is minimal with the favour to GAAIS.

Figure 15.2 depicts the distribution score in attitudes to artificial intelligence depending on gender. The figure shows that men have more favourable attitudes toward artificial intelligence than women. The difference was significant ($t = 1.99$; $p < 0.05$). A similar situation also occurred within the assessment of the questionnaires that described the general attitude toward artificial intelligence. The GAAIS questionnaire identified a substantial difference ($t = 2.17$; $p < 0.05$). In the SATAI questionnaire, the difference was insignificant ($t = 1.70$; $p < 0.09$). On the basis of findings, it is possible to say that men perceived artificial intelligence better than women and men are better in using AI tools.

Figure 15.3 depicts the distribution score in attitudes to artificial intelligence divided according to the study form—full-time or remote study programs. It is evident from the figure that the respondents studying full-time study programs tend to have more positive attitudes to artificial intelligence, but the difference was insignificant.

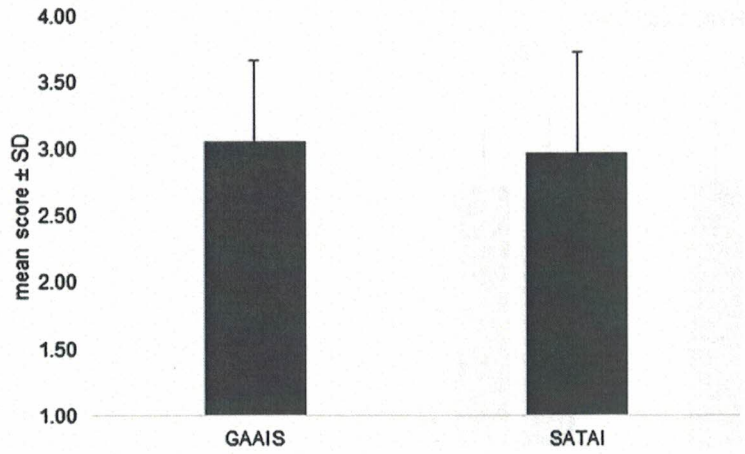


Fig. 15.1 The mean score of scales GAAIS and SATAI

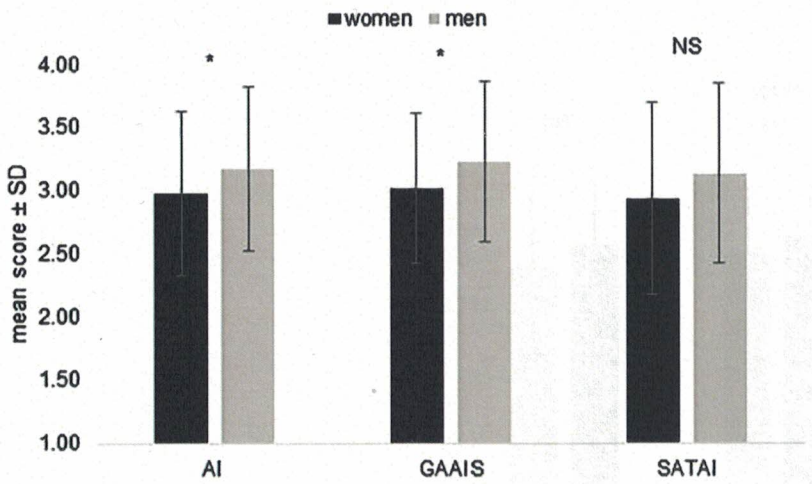


Fig. 15.2 Attitudes to artificial intelligence with respect to gender. *NS* non-significant difference. $^{*}p < 0.05$

Figure 15.4 shows the distribution score in the attitude to artificial intelligence based on residence, more precisely between the respondents living in a city or the country. The figure depicts a more positive attitude of the respondents living in a city, but the difference was insignificant.

Table 15.5 lists correlations between students' attitudes to artificial intelligence and selected independent variables. As it is possible to see in Table 15.5, there was a significant correlation only between the attitudes to artificial intelligence and

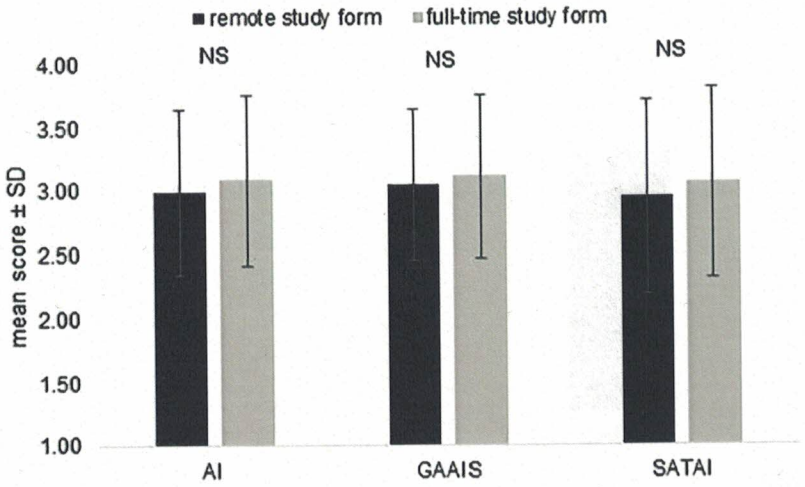


Fig. 15.3 Attitudes to artificial intelligence with respect to study form. *NS* non-significant difference

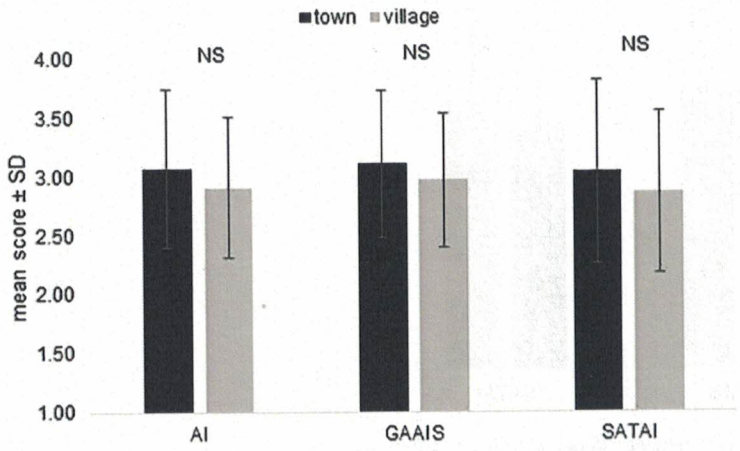


Fig. 15.4 Attitudes to artificial intelligence with respect to residence. *NS* non-significant difference

self-efficacy that was positive, which means the higher the students' self-efficacy, the more positive attitude to artificial intelligence they have.

Table 15.6 depicts correlations between the students' attitudes to artificial intelligence and selected independent variables according to the GAAIS questionnaire. Similarly, the only significant correlation was detected between the attitudes to

Table 15.5 The correlation among attitudes to AI questionnaire and age, self-efficacy and anxiety

	Age	Self-efficacy	Anxiety
Attitudes to AI	$r = 0.01$	$r = 0.21$	$r = 0.00$
	$p = 0.86$	$p < 0.05$	$p = 0.98$

Table 15.6 The correlation among attitudes to AI according to the GAAIS questionnaire and age, self-efficacy and anxiety

	Age	Self-efficacy	Anxiety
Attitudes to AI (GAAIS)	$r = 0.03$	$r = 0.15$	$r = 0.04$
	$p = 0.60$	$p < 0.05$	$p = 0.51$

artificial intelligence and self-efficacy, which was also positive and meant that the respondents manifesting a higher level of self-efficacy had more positive attitudes to AI.

Table 15.7 shows correlations between students' attitudes to artificial intelligence and selected independent variables according to the SATAI questionnaire. Again, the only important correlation was between the attitudes to artificial intelligence and self-efficacy; the same conclusion can be applied here—the respondents with a higher degree of self-efficacy have more favourable attitudes to artificial intelligence. To sum up toward correlations, it is possible to observe the interesting trend that the significant correlation is only between self-efficacy and perception of artificial intelligence; other interval variables showed nearly null effect. The findings are reflected in the discussion chapter.

15.7 Discussion

The main aim of the research was to discover the attitudes of future teachers of primary schools toward using artificial intelligence. The answer to the main aim showed that the respondents expressed neutral attitudes to artificial intelligence; chiefly, they appreciated the potential economic benefits, abilities and advantages that artificial intelligence could bring about. Nevertheless, some respondents were slightly reserved and concerned regarding artificial intelligence's ethical and security aspects. So, the education process could focus on the risks and threats connected with the use of AI during learning and teaching. The respondents expressed their concerns about privacy protection, potential impacts on the job market and possible misuse of this technology. Even if most respondents showed an interest in artificial intelligence and a positive attitude toward using it, a few differences were detected between the individual groups of respondents. One of the most interesting differences was spotted between the respondents, who were divided according to the form and field of study. The students of remote study programs manifested lower favourable attitudes to artificial intelligence than those studying in full-time study programs. This distinction could be connected with different experience and

Table 15.7 The correlation among attitudes to AI according to the SATAI questionnaire and age, self-efficacy and anxiety

	Age	Self-efficacy	Anxiety
Attitudes to AI (SATAI)	$r = -0.00$	$r = 0.23$	$r = -0.02$
	$p = 0.96$	$p < 0.001$	$p = 0.72$

priorities during studying. A slight difference in the attitudes to artificial intelligence was expressed by students living in cities. The respondents living in towns manifested more positive attitudes to artificial intelligence than those living in the country. This distinction might be caused by different sociocultural and economic conditions that can influence the perception of and attitudes to technologies in various regions. Simultaneously, it is essential to point out that despite the different attitudes of those living in a city or the country, there were no statistically significant differences, suggesting that the residence factor is not the only determinant in the attitudes to artificial intelligence. The village schools have quite a small problem, which is connected with the application of different technological tools. This problem is mentioned in many studies. The teachers in rural schools are not only teachers, but they fill more duties in comparison with teachers from urban environment. For example, Zhou (2024) introduced a program aimed to assist village teachers in professional self-development and in the work with modern technological tools and programs. On the basis of this, rural teachers were more familiar with the use of modern technological tool, and also their perception of artificial intelligence was more positive.

However, the positive correlation between self-efficacy and attitudes to artificial intelligence was a substantial finding. The respondents with a higher level of self-efficacy manifested more favourable attitudes to artificial intelligence in all surveyed dimensions, which means that the belief in one's abilities to solve problems and reach goals may play a crucial role in adopting attitudes to new technologies and innovations. The study by Dahmash et al. (2020) confirmed that the students who understood the principles and benefits of artificial intelligence expressed a low anxiety level toward it. Similar results were possible to find in the studies of Kaya et al. (2024) and Schiavo et al. (2024). Nevertheless, the study by Jeffrey (2020) discovered that the students who had a deep understanding and a lot of information about artificial intelligence and who were aware of the possible benefits voiced concerns regarding the negative impacts of artificial intelligence, e.g. on the job market.

Our partial aim was identifying the differences between men's and women's attitudes to using artificial intelligence. The survey implies major differences in attitudes, perceptions and use of artificial intelligence. Men showed much more positive attitudes to artificial intelligence compared to women. Men were more willing to get into contact with this technology and were more open to new technologies and innovations than women. The surveyed men also expressed more admiration for the abilities of artificial intelligence and could see its greater potential for society; they have a stronger tendency to believe that artificial intelligence can work more

effectively than humans. In contrast, women were more worried about the risks associated with artificial intelligence and were more nervous about the idea of its use in the future. These distinctions also became apparent in the area of their willingness to put artificial intelligence into practice, where men showed fewer worries about the negative impacts on society and were more willing to apply it in practice. Moreover, the students who perceive artificial intelligence as useful tend to learn to use it more than the others. This finding confirmed the results of previous studies (Mei et al. 2018; Said et al. 2023; Yıldız 2023). Women consider learning about artificial intelligence at schools more important and show more interest in studying this field than men. To sum up, it is possible to say that the greatest differences between sexes lie in the emotional response to new technologies, perception of risks and benefits of artificial intelligence and willingness to use this technology in practice. Another partial aim was to find out how respondents perceive artificial intelligence in the educational process. The survey results suggest that respondents perceive artificial intelligence in the educational process as a key constituent when preparing students for the challenges and opportunities associated with the digital age. For example, these strategies are reflected in the current curriculum in China (Qin et al. 2019; Hopcan et al. 2024). Women, in particular, considered providing teachers with opportunities for professional development very important so that they could better understand the concepts of artificial intelligence and teaching methods. Fishbein and Ajzen (2011) came to the same conclusion—i.e. pedagogues should use practical applications to demonstrate how they can be used in education, which might improve motivation and sense for learning. The last aim was to observe how future teachers perceive the use of artificial intelligence from the view of ethics. Respondents expressed concerns regarding ethical questions associated with AI use in all questionnaires. Previous studies identified some of the concerns students might have; some of them were limited human interaction (Essel et al. 2022; Magni et al. 2024), risks of leaking and misuse of data (Al-Dosari et al. 2024; Bisdas et al. 2021), absence of emotional bond (Chen et al. 2023), breaking the code of ethics (Gillissen et al. 2022) and limitation of job opportunities (Gedrimiene et al. 2024; Gong et al. 2019).

In our study, respondents expressed similar worries to those in the above-listed surveys, chiefly concerns about losing control over technologies, potential misuse of artificial intelligence or negative impacts on society and the working environment. This result is supported by a study (Ghotbi et al. 2022) conducted at an international university in Japan, where students were asked to choose the most important ethical issue associated with artificial intelligence that would impact the future. There were nine ethical issues suggested by the World Economic Forum. Also, their task was to explain why they considered the chosen issue the most important. Most students chose unemployment as the main ethical question associated with artificial intelligence. Another major group of students expressed their concerns about ethical issues connected with the emotional side of artificial intelligence, including its impact on human behaviour and emotions. The ethical aspect of artificial intelligence use belongs among main topics not only in educational area, but also in all areas. The ethical aspect in educational process brings higher risk behaviour;

students and pupils see the potential of artificial intelligence in plagiarism, cheating during test and cheating during creation of homework and other materials suggested by teachers. Similar ideas were presented in the study of Dolunay and Temel (2024), where authors quoted that artificial intelligence created the environment, where all actors of educational process could find various possibilities of artificial intelligence to mitigate their work. Authors mentioned the change of authorship or stealing of data. On the basis of previous kinds of information and our findings, the education process regarding artificial intelligence could primarily focus on the ethical discussion regarding the use of artificial intelligence. During the explanation, teachers should focus on what is plagiarism with the use of artificial intelligence and the role of artificial intelligence as a useful tool during learning process.

Authors cannot foresee the future but could expect that constant growth and advancement may change society as the Industrial Revolution did. Many job positions may disappear due to the process of automatisation; however, many new ones may develop. In my opinion, the notion of work and the perception of its meaning will change, but it does not mean that we should be afraid of artificial intelligence. On the contrary, those who learn to use it will be at an advantage. We must remember that humankind has already experienced similar technological breakthrough advancements, and every time, they have brought about improvements in everyday life. For example, let us remember when the world shifted from using huge computers occupying an entire room to laptops or when cellular networks and smartphones replaced landlines.

15.7.1 Limitations of Study

The presented research study has some limitations, which could be divided into two parts. The first of them has a methodological character. The author used only quantitative approach toward obtaining and analysing data; the qualitative approach to the interview could bring more detailed aspects in the individual's view on using artificial intelligence and its use in the education process. Also, the use of both quantitative and qualitative approaches could be beneficial; the mixture of questionnaire and observation would be beneficial for research. Other methodological limit is the selection of respondents; the study includes only future teachers from the Czech Republic; probably, the in-service teachers could have a different point of view on the use of artificial intelligence in the education process. This view could be positive or negative, and it could bring another explanation to the potential use of artificial intelligence. Another methodological limit, which could be presented also in the suggestions for further research, is in providing longitudinal research. This study could take a few months. In the first step, the distribution of research tool regarding the perception and use of artificial intelligence could be used. The next step should be the implementation of artificial intelligence in the educational practice of pre-service or in-service teachers. This implementation could take time, minimally 6 months, due to the full use of AI in the education process. After the

implementation of AI tools, the next distribution of research tool should be realised. Accordingly, the change of AI perception and use could be observed. Longitudinal study has many advantages in advancing knowledge about the use and perception of different phenomena, notably in providing information about using and perception of artificial intelligence as in this case, about continuity and prediction and about within-individual change (Farrington 1991). As Ng (2025) mentioned in the study, longitudinal studies with sufficient number of respondents could reveal other variables, which can influence the perception of artificial intelligence. Similar ideas were possible to find in the study of Polyportis (2024) that it is possible to detect the development of artificial intelligence usage, to better control variables, which could influence the use and attitudes toward AI. Also, it is possible to observe cheating behaviour among pupils, students and even teachers.

The author also identified other limitations that may affect the interpretation of the collected data. Because the questionnaire was distributed electronically, there was a risk that the questionnaires would be filled in by people who did not belong to the target group of this survey. Thus, we cannot guarantee that all respondents were future primary school teachers who were of central importance to the study. Furthermore, the quantitative survey consisted of about three-quarters of women but only one-fourth of men, which implies a distortion of gender representation based on the distribution of students; this fact reflects the situation in many teacher-training faculties.

15.8 Conclusion

Artificial intelligence is becoming a more significant part of our lives and affects many fields, including education. Its use in the educational process and teaching practice has the potential to influence how we study and teach significantly. Understanding future teachers' attitudes toward this technology is essential to assess its potential and find optimal ways of integration into lessons. In the theoretical part, we emphasised the fact that the significance of artificial intelligence in society is increasing; therefore, it is vital to incorporate a curriculum in the academic study programs for future primary school teachers that would cover the basic principles and applications of artificial intelligence; this would contribute to a better understanding of this technology, and teachers could more appropriately prepare their students for the future.

It is vital to stress the importance of supporting the continuous education of future and current teachers. Academic institutions should provide opportunities for further education and professional development focusing on artificial intelligence. Such education could include courses, seminars or workshop activities that develop skills and competencies for using AI in education. Simultaneously, we should not forget to support research activities and projects that investigate the relationships between using artificial intelligence and education. In this way, academic practice can contribute to a better understanding of teachers' and students' needs in the era

of fast technological development. Supporting interdisciplinary approaches in the education of future teachers might play a crucial role, including integrating findings from psychology, sociology and information technology, which would enable students to learn about interactions between people and technology.

Artificial intelligence could be used in a practical way in the education process in different ways, including in the form of automation of administrative processes and tasks, curriculum and content development, instruction and students' learning processes. AI has improved efficiency in the performance of administrative tasks, such as reviewing students' work, grading and providing feedback on assignments through automation using Web-based platforms or computer programs. Teachers are more effective and efficient, and students have a personalised and richer learning or educational experience. Artificial intelligence in education presents an opportunity to break the physical barriers posed by national and international borders. Learning online or use of Web-based learning platforms means that the materials are accessible from anywhere in the world, and leveraging other aspects of AI, such as language translation tools, makes it possible for students to learn best within the context of their individual abilities. It is important to educate future teachers to make them aware of the cheating behaviour by using AI and different tools. Future teachers should be able to recognise situations where the use of AI is harmful and where the AI is a useful tool.

Future teachers' attitudes and approaches to this field may change with the development of new technologies and discoveries of new possibilities of artificial intelligence. The study could thoroughly analyse how fast the changes occur and what factors contribute to adopting attitudes to artificial intelligence. The analysis of quantitative data, accompanied by a qualitative analysis, may bring a deeper understanding of motivations and emotional factors that influence the perceptions and attitudes to artificial intelligence. It would be interesting to conduct an international comparative survey. The comparison of attitudes to artificial intelligence across various cultures and regions could reveal culturally specific factors that affect the perception of this technology among future teachers as well as the whole population. An independent study could deal with a more detailed analysis of education and the working environment. The study could investigate how important the learning environment is for forming future teachers' attitudes to this technology and how direct involvement in the working process influences the perception of artificial intelligence.

An interesting topic to research could be an analysis of how changes in attitudes to artificial intelligence impact society as a whole—for example, assessing how such changes affect political decisions, educational systems or economics. The role of various information sources and media could be considered in this survey. Media and public discussion may be vital in creating opinions and attitudes to this technology. Therefore, it might be essential to investigate what information and interpretations people accept and how these factors affect their attitudes. Moreover, looking into the relationship between socioeconomic factors and attitudes to artificial intelligence may be helpful. For example, we can assume that people with higher education or higher social status may have different opinions on the significance of

artificial intelligence than people with lower education or lower social status. Understanding these socioeconomic differences may help better understand how technological advancement reflects in the attitudes and values of various social groups. Further studies might focus on ethical issues associated with using artificial intelligence and on factors that affect trust in this technology's proper and ethical use. This study could help identify critical aspects that influence the acceptance of artificial intelligence in society.

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