

Prerequisites for Higher Quality Education: Teachers' Attitudes on the Application of Artificial Intelligence Tools in Teaching

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Abstract: *This paper presents research on the impact of artificial intelligence (AI) on improving the quality of education. The focus of the research is teachers' views on the application of AI tools in primary and secondary education. The application of advanced technologies such as AI opens up new opportunities, potentials, and challenges in education. With the help of AI, which simulates human intelligence in making inferences or predictions, computer systems can provide personalized guidance, support, or feedback to students and teachers in the educational process. The paper aims to identify the prerequisites for quality education, analyze teachers' views on the application of AI tools in the teaching process, and highlight the perceived advantages of the application. Successful integration of AI tools depends on teachers' positive attitudes, technological literacy, and readiness for change. The study concludes that adequate training and support for teachers, together with transparency and understanding of potential risks, can significantly contribute to the successful implementation of AI technology in education.*

Keywords: *AI tools; teaching; teachers' attitudes; education*

1. INTRODUCTION

In the field of education, artificial intelligence (AI) is used in teaching, administration, and research. In modern research, the positive effects of using AI in the field of teaching practice are observed, and they can be seen through the reduction of teaching duties, faster completion of activities, opportunities for profiling, and predicting student needs and evaluating student work.

This type of learning removed the gap between real life and technological ubiquity and an educational system in which it was not affirmed to a sufficient extent.

Western intelligence affects the quality of education. Adequate training and support for teachers, along with transparency and understanding of potential risks, can significantly contribute to the successful implementation of AI technology in education.

Artificial intelligence can be used in education in many ways, including:

- automatic generation of learning programs;
- helping students to understand complex topics;
- visualization of data and concepts;
- automatic text recognition and classification;

- helping students acquire new technology skills;
- analysis of students and prediction of success;
- personalization of content and lessons;
- automatic knowledge testing;
- analysis of speech and language for better understanding of students;
- simultaneous translation of speech and text;
- autonomous learning for individualized education;
- automatic correction of grammatical errors;
- generation of questionnaires and tests, etc.

Artificial intelligence helps students get the most out of their education. Systems based on AI can provide individualized support to students with different levels of knowledge. Technology provides personalized assistance, allowing students to work on their weaknesses and strengthen their skills [1]. Artificial intelligence helps teachers educate children more effectively. Teachers can use technology to monitor student progress and identify problem areas. In addition, AI allows them to plan and conduct lessons more easily.

The model for improving the teaching process is "understanding the needs of students", or more precisely "identifying areas where AI can help improve the learning experience". Applications of AI in education should enable more purposeful,

dynamic, and interesting learning. It is precisely AI that offers the possibility of improving educational systems in a way that was not possible until now [2].

2. PREREQUISITES FOR HIGHER QUALITY EDUCATION

Availability of learning materials has always been a problem, but AI now provides access to educational content to people around the world, thereby making education more accessible.

Artificial intelligence will make education more efficient, accessible and adaptable. Education systems around the world are beginning to adapt to AI technology, enabling students and teachers to reach their full potential.

Artificial intelligence can be applied in education in different ways. It can be used to improve educational programs and curricula and to help improve the quality of teaching. In addition, it can also help improve learning tools, such as games, simulations, and interactive applications, and be useful in distance education, providing personalized support to students and thus contributing to their greater interest in learning and a better understanding of the material. Artificial intelligence can improve the quality of education, which will lead to better educational outcomes, and can make it accessible to all, which will ultimately lead to a better society [3, 4].

School teachers can participate in the development of AI in several ways. First, they can use various AI tools and platforms to improve their teaching methods and increase student productivity. Teachers will also be able to help develop tools and procedures for adapting AI algorithms that can adapt education to students to achieve the best results. Finally, teachers can get involved in training and educating students about AI to help them acquire the necessary skills to help them achieve their educational goals [5, 6].

3. METHODOLOGY

Using a mixed research design, our study included a sample of N=140 primary and secondary school teachers. The questionnaire was developed by combining an adapted attitudes scale and a set of original questions designed by the authors. The instrument consisted of two parts: (I) Demographic data of the sample (5 questions) and (II) Questions related to teachers' views on the application of AI tools (10 questions). In the second part, a scale is adapted for AI.

The questions compiled by the researchers were related to the application of AI in teaching, i.e. for solving tasks from teaching subjects, the types of tasks for which it is mainly used, and assessment. The data was collected by surveying teachers online, during the month of May 2024.

Teachers from the elementary school in Ivanjica, the secondary technical school in Ivanjica, and the secondary electrical engineering and construction school in Jagodina participated in the survey.

In the first part of the questionnaire, respondents were asked to provide demographic information, including gender, smartphone ownership, and how often they use their smartphones. The sample consisted of 20% men and 80% women. In terms of smartphone ownership, 79% own smartphones while 21% do not (Fig. 1).

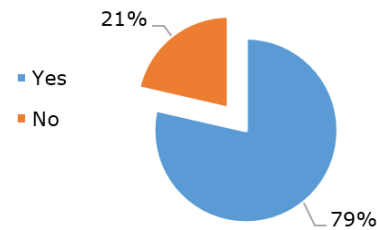


Figure 1. Possession smartphone

Respondents declared that 35% use a smartphone for 1 to 2 hours a day, 45% use a smartphone for 2 to 5 hours a day, while 20% of respondents use a smartphone for more than 5 hours during the day (Fig. 2).

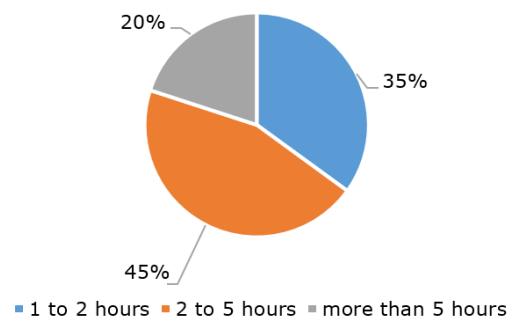


Figure 2. Usage mobile phone

4. RESULTS AND DISCUSSION

The main part of the questionnaire investigated the attitudes of teachers in primary and secondary education about the application of AI tools in teaching.

4.1 Results

Respondents most often used laptops, followed by mobile phones, personal computers, and tablets. Other devices were mentioned much less frequently (Fig. 3).

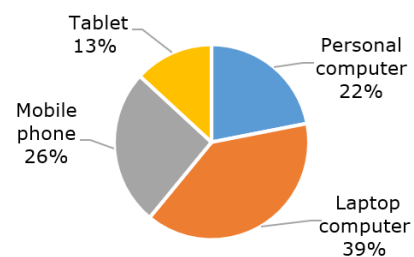


Figure 3. Most commonly used devices

Teachers rated their competence in using computers for applying AI tools in the classroom as follows: very low - 27%, low - 54%, weak - 17%, high - 2%, and very high - 0%. This indicates that most teachers feel inadequately prepared to integrate AI tools into their teaching practices (Fig. 4).

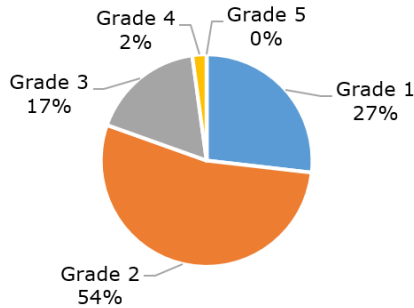


Figure 4. Competency level for using computers to apply AI tools (1 – very low, 2 – low, 3 – weak, 4 – high, 5 – very high)

Teachers also evaluated their competence in using different devices for applying artificial intelligence tools in teaching. The results were as follows: very low - 15%, low - 42%, weak - 41%, high - 2%, and very high - 0%. These ratings suggest that a significant majority of teachers feel underprepared to effectively use AI tools in their teaching, with almost none feeling highly competent (Fig. 5).

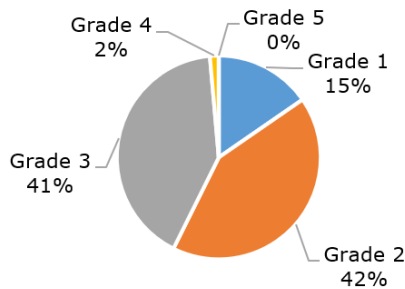


Figure 5. Competency level for using all devices and applying AI tools (1 – very low, 2 – low, 3 – weak, 4 – high, 5 – very high)

Teachers' experience with using AI tools is mostly limited, with the following ratings: very low - 20%, low - 37%, weak - 42%, high - 1%, and very high - 0%. This indicates that almost all teachers have minimal experience with AI tools, highlighting a significant area for potential growth and professional development (Fig. 6).

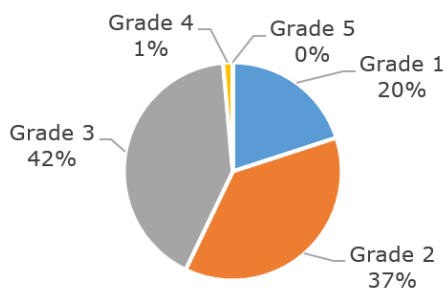


Figure 6. Experience using AI tools (1 – very low, 2 – low, 3 – weak, 4 – high, 5 – very high)

To the question What AI tool have you used so far, it was possible to choose more than one answer:

- 1) Tools for writing and creating text (e.g. Quillbot, Grammarly,...)
- 2) Learning Analytics (eg Brightspace by D2L, Blackboard Analytics, Tableau for Learning Analytics)
- 3) Automated grading (eg Gradescope, Turnitin, Crowdmark)
- 4) Artificial assistants (eg SIRI, Hello Google, Cognii, Century Tech)
- 5) Virtual assistants (eg IBM Watson Assistant, Squirrel AI, Jill Watson)
- 6) Intelligent tutoring systems (eg Blippar, Thinkster Math, Carnegie Learning, Age of Learning, Amira Learning, Cognitive Tutor, Jill Watson, DreamBox, Knewton, Carnegie Learning)
- 7) Natural language processing (e.g. Google Cloud Natural Language API, IBM Watson Natural Language Understanding, Amazon Comprehend)
- 8) Smart content creation (eg Canva, Articulate 360, Quillionz)
- 9) Personalized learning (eg DreamBox, Knewton, Smart Sparrow)
- 10) Predictive modeling (eg Civitas Learning, Learning Analytics and Prediction (LeaP), D2L Insights)
- 11) Speech recognition (e.g. Nuance)
- 12) Customized learning (eg McGraw-Hill ALEKS, Duolingo, DreamBox)
- 13) Augmented and virtual reality (eg Oculus VR for Education, Google Expeditions, zSpace)
- 14) Learning foreign languages (eg Duolingo, Blue Canoe)
- 15) Chat-bot (eg Chat GPT)
- 16) Other.

More than half of the surveyed teachers are most familiar with chatbots. One-quarter of respondents are aware of smart content creation. Other tools are still not available to teaching staff (Table 1).

Table 1. The most frequently used AI tools

AI tool	Percentage
Intelligent systems for teaching	4%
Natural language processing	6%
Smart content creation	25%
Learning foreign languages	12%
Chatbot	53%

When asked if they were trained to use AI tools in teaching, the respondents' answers were as follows: Yes - 10%, No, but I plan - 54%, and No and I don't plan - 36%. This indicates that only a small percentage of teachers are currently trained in the use of AI tools, while the majority plan to be trained. However, a significant part of teachers do not intend to be trained, which could be an obstacle to the wider application of AI tools in education (Fig. 7).

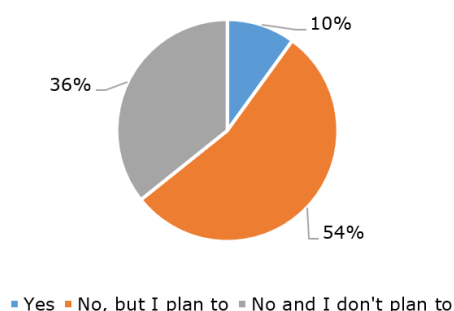


Figure 7. Training in the use of AI tools in teaching

The proposal would be for such training to be offered to schools as a mandatory form of professional development. Teachers would have a different attitude in that case.

Table 2 shows the methods teachers would prefer for training sessions in acquiring knowledge and skills for using AI tools in education.

Table 2. The way to acquire and improve your knowledge for using AI tools in teaching

The way to acquire and improve your knowledge for using AI tools in teaching	Percentage
Through seminars	12%
Through the forum	3%
I do my research	22%
I did not acquire the appropriate knowledge	80%

To the question What in your opinion and current practice, advantages of using artificial intelligence tools in teaching, it was possible choose more than one answer:

- 1) Positive influence on the level of knowledge and engagement of students
- 2) Interest in learning
- 3) Development of problem-solving strategies
- 4) A more pleasant atmosphere when studying and checking students' knowledge
- 5) The method of examining and learning new material is adapted to the interests and abilities of students"
- 6) More objective assessment

The results of research on the advantages and disadvantages of using tool A are given in Fig. 8 and Fig. 9).

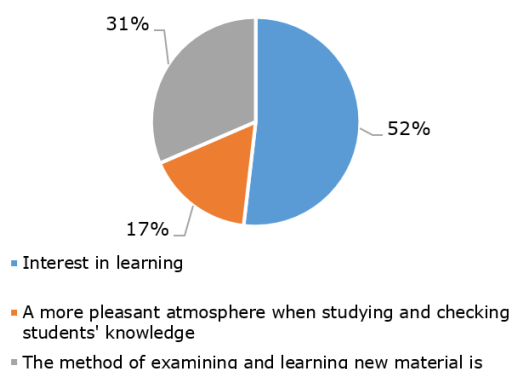


Figure 8. Advantages of using AI tools in teaching

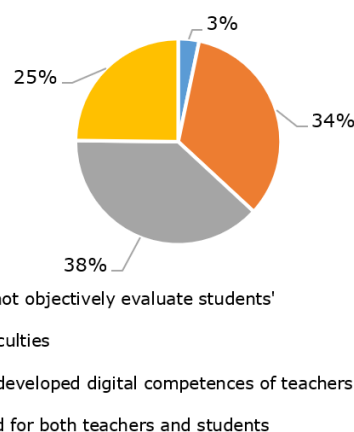


Figure 9. Disadvantages of using AI tools in teaching

To the question "Which are, in your opinion and current practice, the disadvantages of using AI tools in teaching", it was possible to choose more answers:

- 1) Excessive consumption of time
- 2) Teachers cannot objectively evaluate students' knowledge
- 3) It is difficult to establish a balance between student independence and providing support
- 4) Technical difficulties
- 5) Insufficiently developed digital competencies of teachers or students
- 6) More workload for both teachers and students
- 7) Other.

As disadvantages of using artificial intelligence tools in teaching, teachers report insufficiently developed digital competencies of teachers or students. Such conclusions build on the previous answers related to competencies. Also, teachers report heavy burdens with new technologies.

Insights into each of the following AI claims are detailed in Tables 3–6 (note: 1 – I do not agree at all, 2 – I do not agree, 3 – I neither agree nor disagree, 4 – I agree, 5 – I completely agree):

- Knowing the processes through which deep learning enables AI to perform voice recognition tasks (Table 3)
- I understand why AI needs large amounts of data (Table 4)
- I understand how computers process an image for visual recognition (Table 5)
- I understand how artificial assistants like SIRI or Hello Google manage human-computer interaction (Table 6).

Table 3. Knowing the processes through which deep learning enables AI to perform voice recognition tasks

Grade	Percentage
Grade 1	9%
Grade 2	26%
Grade 3	58%
Grade 4	7%
Grade 5	0%

With knowledge of the processes through which deep learning enables AI to perform voice recognition tasks, the majority of respondents neither agree nor disagree. Very few respondents agree with this statement.

Table 4. *I understand why AI needs large amounts of data*

Grade	Percentage
Grade 1	4%
Grade 2	6%
Grade 3	25%
Grade 4	12%
Grade 5	53%

Table 5. *I understand how computers process an image for visual recognition*

Grade	Percentage
Grade 1	36%
Grade 2	10%
Grade 3	36%
Grade 4	18%
Grade 5	0%

How artificial assistants like SIRI or Hello Google manage the interaction between man and computer, the largest number of respondents neither agree nor disagree with the uninformed.

Table 6. *I understand how artificial assistants like SIRI or Hello Google manage human-computer interaction*

Grade	Percentage
Grade 1	7%
Grade 2	14%
Grade 3	70%
Grade 4	9%
Grade 5	0%

4.2. Discussion

Teachers' views on the application of AI tools in primary and secondary education

The findings of this study shed light on the attitudes and preparedness of teachers in primary and secondary education regarding the application of AI tools in teaching.

First, regarding the devices used for teaching, respondents mainly rely on laptops, followed by mobile phones, personal computers and tablets. This suggests that teachers use familiar technology in their teaching practices, albeit with limited integration of newer devices.

However, despite the prevalent use of technology, teachers rate their competence in using computers to implement AI tools relatively low, with the majority falling to low to weak levels of competence. This points to a gap between device familiarity and the ability to effectively use AI tools in the classroom.

The level of competence in using all devices to implement AI tools was rated at a modest level of

3. This indicates a consistent perception among teachers that they lack a higher level of competence in using AI tools across devices.

When it comes to experience with AI tools, most teachers are most familiar with chatbots, followed by smart content creation. However, awareness and use of other AI tools remain relatively low, indicating a need for further training and exposure in this area.

The introduction of technology into education is nothing new, but the speed with which AI is being integrated into the teaching process represents a significant step forward. AI tools offer the potential to personalize learning, automate administrative tasks, and improve access to educational resources [7]. However, as these tools are introduced into primary and secondary schools, teachers' attitudes become a key factor in their successful implementation. This chapter explores teachers' attitudes toward the application of AI tools in education, analyzing the benefits, challenges and obstacles these tools bring.

Advantages of applying AI tools in education

In terms of training, it is apparent that very few teachers have received formal training in the use of AI tools, with more than half of respondents reporting no training at all. This highlights a potential reluctance among teachers to embrace new technologies or a lack of opportunities for professional development in this area.

Proposing mandatory training for teachers in the application of artificial intelligence tools could potentially change attitudes toward the adoption of technology in education. By providing structured training opportunities, teachers can feel more empowered and confident in integrating AI tools into their teaching practices.

Many educators recognize the numerous benefits that AI tools can bring to the educational process [8]:

- *Personalization of learning:* AI enables the creation of individualized lesson plans that are adapted to the needs and pace of each student. This can significantly improve student engagement and their ability to absorb the material.
- *Automate administrative tasks:* AI-based tools can automate routine tasks such as test grading, score analysis, and homework administration, allowing teachers to focus more on interacting with students.
- *Improving access to educational resources:* AI can help organize and search large amounts of educational materials, making it easier for students and teachers to access relevant information.

Challenges and obstacles

While the benefits of AI tools in education can be significant, educators face some challenges and obstacles:

- *Technological literacy:* Many teachers may lack the knowledge and skills to effectively use AI tools. This requires additional training and professional development.
- *Data privacy and security:* Using AI tools often involves collecting and processing large amounts of data about students. This raises questions about the privacy and security of that data.
- *Resistance to change:* Some teachers may be skeptical of new technologies and resistant to changes in traditional teaching methods. This can be a barrier to the widespread adoption of AI tools.
- *Ethics and bias:* AI systems can be subject to biases present in the data they are trained on. Teachers must be aware of these risks and able to recognize and address potential problems.

Teachers' attitudes towards AI tools

Research shows that teachers' attitudes toward AI tools vary, but several key themes frequently emerge:

Positive Attitudes: Teachers familiar with AI technologies often express positive attitudes, recognizing the potential benefits of personalizing learning and reducing administrative burdens.

Skepticism and concern: Some educators express skepticism about the effectiveness of AI tools, worrying about their reliability, bias, and impact on the teacher's role in the educational process.

Need for support: Many teachers emphasize the need for continuous training and support to feel competent and confident enough to use AI tools in the classroom.

The introduction of AI tools into primary and secondary education has the potential to transform the educational process, but the attitudes of teachers play a key role in this transformation. While many educators recognize the benefits that AI can bring, they also face significant challenges. Understanding and addressing these challenges, through adequate training, support, and transparency, are key steps toward successfully integrating AI tools into education [9]. Only by actively involving teachers and taking into account their views and experiences can AI become a useful tool that improves the educational process and contributes to better outcomes for all students.

The role of teachers in the digital age

From the analysis of the questionnaire, it can be concluded that the use of AI supports and facilitates the work of teachers, such as ChatGPT, influencing the improvement of the educational process in various aspects. So, for example, these tools are

used in the evaluation of students, in the processing of student data to determine habits and patterns, and to identify students who are at risk of failing.

The application of AI can help teachers by saving time, improving the quality of work, and contributing to the personalization of experiences. A very important segment is the professional development of teachers in this field. Older teachers are not sufficiently familiar with AI.

To use technology in education in a way that contributes to changing and transforming the teaching process, it is necessary to develop the competencies of students (and teachers) for the age in which we live, including for the application of AI.

AI can help teachers design lessons, assignments, grading criteria, and so on. Teachers should be enabled to follow new technology, apply new tools, that their students already use (albeit for other purposes), and become role models for them.

The digital age has revolutionized many aspects of life, including education. Technological advances have transformed traditional methods of learning and teaching, enabling access to information and resources. In this changing environment, the role of the teacher is becoming more and more complex and important. In this chapter, we will explore how the role of the teacher is changing and adapting in the digital age, and what key competencies are needed to successfully perform this job.

Transformation of the traditional role of the teacher

Traditionally, teachers were the primary sources of knowledge and information, imparting material through lectures and text materials. In the digital age, this model is changing as students now have access to a vast wealth of information through the Internet, educational applications, and digital tools [3]. Teachers are no longer the only sources of knowledge, but become guides and mentors who help students navigate through an information-rich world.

One of the key aspects of a teacher's role in the digital age is the possession of digital literacy and technological competence. That includes:

Use of digital tools and platforms: Teachers must be adept at using a variety of digital tools to create interactive and engaging lessons. This can include the use of virtual reality tools, interactive whiteboards, collaboration applications, and many others [3].

Understanding Online Security: In the digital world, security is critical. Teachers must educate students about safe Internet use, privacy protection, and recognizing misinformation.

Integrating technology into the curriculum: Technology should be integrated into the curriculum in a way that enriches learning. This

requires creativity and innovation in the design of lessons that use technology to improve student understanding and engagement.

There are specific types of training programs that could help teachers become more proficient in using AI tools: seminars, conferences, expert meetings in the field of artificial intelligence. The introduction of AI into the education system opens up the possibility of creating a dynamic and adaptive environment for learning and teaching, only if it is used responsibly with finding solutions to the risks and problems that AI brings.

In order to strengthen the teaching staff in education for this process, it is necessary to have more educational contents where the essential aspects of the application of artificial intelligence in education are shown.

Online and hybrid learning

The COVID-19 pandemic has accelerated the adoption of online and hybrid learning models. Teachers had to quickly adapt their teaching methods to maintain continuity of education. This experience showed the importance of flexibility and willingness to learn new technologies. In the future, a combination of online and traditional learning is likely to become the norm, and teachers will play a key role in ensuring that this transition is smooth and effective.

Digital tools enable the personalization of learning like never before. Teachers can now use analytics tools to track student progress and tailor instruction to individual needs. This is particularly useful for identifying students who need extra support or those who are more advanced and need more challenging tasks.

Developing critical thinking and digital ethics

In the era of information overload, teachers have a key role in developing students' critical thinking. They must teach students how to assess the credibility of sources, recognize bias, and understand the context of information. In addition, digital ethics is becoming increasingly important, and teachers need to promote responsible and ethical behavior online.

The study assessed teachers' understanding of various artificial intelligence concepts, such as deep learning processes, the need for large data sets, image processing for visual recognition, and the functioning of artificial assistants. The results indicate a mixed level of understanding of these concepts, with room for improvement in certain areas.

The findings point to the need for targeted professional development programs aimed at strengthening teachers' competence and confidence in the effective use of AI tools in teaching. In addition, efforts should be made to solve problems and provide support to overcome

barriers to the integration of technology in education.

Accessibility of AI tools

When a new tool appears, not only a digital one, you should always investigate what benefits its use brings. The same is the case with artificial intelligence. Artificial intelligence tools can help teachers in professional development, researching new teaching methods, getting new ideas for the implementation of teaching as well as achieving educational outcomes and goals, on better monitoring of student achievements, as well as behavior, disruptive factors and in general on the overall life of a class for teaching time

A common method of monitoring the teaching process is recording with a video camera and analyzing the recordings after the implementation. However, today's recording technology makes it possible to recognize and mark each face, recognize behavior, activity levels, and collect various meta data about a person and a group.

Artificial intelligence is a great tool, but it is just that: only a tool in the hands of an expert or a learner. Like any tool, if used critically and purposefully, beneficial results are obtained

Artificial intelligence can also be put to good use for teaching planning, for example looking for inspiration or ideas. In a "conversation" with artificial intelligence, we can get a kind of idea. Such a "conversation" can be even more successful if we introduce the ideas we describe to artificial intelligence in cooperation with colleagues, because more people have more useful and original ideas. Ideas can be implemented in a single query to artificial intelligence or make several independent queries that can then be compared, analyzed, critically reviewed, summarized and create something entirely new and different.

Specific areas for future research, such as studies to assess the long-term impact of AI tools in education: The role of artificial intelligence in improving teaching; Artificial intelligence and education in the future; The importance of deep learning in education; Checking knowledge with the help of Western intelligence; Use of artificial intelligence platforms and tools. Creating educational content and teaching materials using artificial intelligence. Although the work of teachers is most often considered through work with students in the classroom, it is much more complex, and requires comprehensive preparation for the implementation of the teaching process. Preparation for teaching is a complex job, especially if we follow the requirements of modern education, teachers gain through their professional development.

Artificial intelligence can help in the preparation of teaching materials. It is important to adhere to ethical guidelines and key requirements for the

reliable use of artificial intelligence. By using artificial intelligence tools to help in the creation of learning and teaching materials, teachers can get numerous ideas and help on how to create them and thus shorten the time for their creation in order to be adapted to all students.

5. CONCLUSION

This research paper provides a deeper insight into the attitudes and readiness of teachers in primary and secondary education regarding the application of AI tools in teaching. The results indicate the existence of challenges in the process of integrating AI technologies into the teaching process. Although technology is present in education, teachers show low confidence in using AI tools, as well as a lack of formal training in this area. There is significant scope for improving the digital skills of teachers and students, as well as for the development of educational programs that would support the implementation of AI technologies in teaching. Further research and development of training initiatives could contribute to improving the acceptance and success of using AI tools in education.

Many educators recognize the numerous benefits that AI tools can bring to the educational process:

- Personalization of learning
- Automation of administrative tasks
- Improving access to educational resources.

While the benefits of AI tools in education can be significant, educators face some challenges and obstacles:

- Technological literacy
- Data privacy and security
- Resistance to change
- Ethics and bias.

Teachers should be enabled to follow new technology, apply new tools, that their students already use (albeit for other purposes), and become role models for them.

ACKNOWLEDGEMENTS

This study was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, and these results are parts of the Grant No. 451-03-66/ 2024-03/200132 with University of Kragujevac – Faculty of Technical Sciences Čačak.

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