

Evaluating the quality of responses generated by ChatGPT

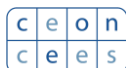


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Corresponding author:
Danimir P. Mandić

Correspondence email:
danimir.mandic@uf.bg.ac.rs,
gordana.miscevic@uf.bg.ac.rs,
ljiljana.bujisic@uf.bg.ac.rs

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Danimir P. Mandić , Gordana M. Mišćević , Ljiljana G. Bujišić

University of Belgrade, Faculty of Education, Belgrade

Abstract:

Asked through this application, and finally, to express their views on the quality of the responses generated by ChatGPT. The obtained results are presented and discussed. Although most of our interviewees have heard about this application, the experiences they had were not planned for their professional development, making this an area for improving the program of their institutional education. The students expressed their motivation and willingness to evaluate the possibilities of using this language model and learn how to use it, with the awareness that artificial intelligence cannot replace their role, but that it has become a key tool in education, which opens new opportunities for improving the teaching and learning process.

Keywords: artificial intelligence; ChatGPT; teachers' attitudes; improving the educational process; AI benefits

INTRODUCTION

The increasing progress of technology, especially the wider application of artificial intelligence, is leading to significant changes across various domains, especially in education. It has an increasing impact on how we learn, organize teaching, and evaluate teaching outcomes. It is difficult to define the concept of artificial intelligence simply and concisely (Lindner et al., 2019). Although artificial intelligence (AI) has long been present in computer science research, recent technological progress has led to a tremendous increase in interest in its application in the field of education (Stolpe & Hallström, 2024). AI consists of a few levels that emerge from simpler to more complex: Artificial Narrow Intelligence (ANI)-which supports users to solve their problems in one narrow area using neural networks and machine learning. Artificial General Intelligence (AGI) is still developing but one day it will be able to solve several tasks almost like human beings within a wide range of scenarios. Artificial Super Intelligence (ASI)-which includes agents whose functioning will be more superior to human intelligence and development will be very strong and fast even without human supervising and help (Kelly, Kaye & Oviedo-Trespalacios, 2023). Traditional models of education are becoming out dated and we are facing the challenge of adapting teaching methods, due to the emergence of new tools and the use of new technologies. GPT models have achieved state-of-the-art specificity within a broad domain of natural language processing tasks, including text generation, question answering, language translation, and sentiment analysis (Ray, 2023). One standout example is ChatGPT - a powerful machine learning software called Generative Pre-trained Transformer. It is a type of language model created to use deep learning techniques to analyze and generate text. It uses large amounts of text to understand and generate human language. Since its release on 11th November 2022, it has become the fastest-growing user application in history (Lo, 2023; Su & Yang, 2023a; Rospigliosi, 2023). The population from China had the most interest in the term ChatGPT on Google Trends, followed by the USA, Canada, India, and Australia (Gupta et al., 2023). The language structure of this model and the improve-

ment and understanding of the grammatical structure of the language make ChatGPT suitable for application in various domains. ChatGPT's information base is diverse from various sources, such as books, magazines, websites etc. Due to the possibility of unreliable information or lack of updates, and on the other hand, being based on a learning algorithm, ChatGPT has a good potential for application in education, with a measure of caution. Advantages such as answering questions, creating quizzes, as well as tests and evaluations (Gupta, Mufti, Sohail & Madsen, 2023) indicate that artificial intelligence has the potential to revolutionize the application of AI in education. The Chat GPT language model is suitable for all levels of education, as well as for professional development. By using ChatGPT, primary school pupils develop reading and writing skills, as well as their writing style and critical thinking, through the suggestions of correct grammatical and syntactical writing. On the other hand, University students can use ChatGPT to research various topics, develop critical thinking, and access information about under-researched and current topics, which enables them to better comprehend and analyze their material (Khoso, Ali, Aslam, 2023). By communicating with ChatGPT, students can ask questions in their own words, request clarification, and learn at their own pace, with tailored answers to asked questions. The ability to engage in a series of questions, follow-up answers and clarifications, allows students to personalize the information they receive (Rospigliosi, 2023). The capabilities of ChatGPT in education are particularly significant when it comes to self-directed learning and methodological flexibility in personalizing the learning path that enables customized educational experiences (Yu, 2024; Chiu, Xia, Zhou, Chai, Cheng, 2023). In addition to the above, ChatGPT can be used for professional development, group and distance learning, as well as assisting pupils with developmental difficulties (Khoso, Ali & Aslam, 2023).

From the perspective of Vygotsky's sociocultural theory (1974), each higher mental function is developed in interaction with a more competent partner and then becomes internalized. The pupil, when interacting with a more competent partner, attempts to apply his inadequate strategy for solving the task, while the more competent partner introduces his approach to solving the task and his strategies into that interaction. By observing the interaction, although not a human being, tools such as ChatGPT can mediate human thinking and learning. Interacting with ChatGPT helps people develop new understandings and ways of thinking through a process of internalization. In a survey of STEM teachers, it was found that the majority positively experienced AI as a source for superior scaffolding (Kim & Kim, 2022). The development and application of artificial intelligence affect all areas of life, as well as changing the role of teachers. There is a need for better insight into some basic pedagogical issues (Mišćević Kadijević, Mandić, Bojanić, 2019). More and more researchers indicate the need to study the design of AI instruction with a focus on formulating a flexible learning task that integrates AI knowledge into existing curricula (Li, Fengchao & Zhang, 2024). Teachers can use ChatGPT to enable a more creative approach to their pupils' work, for lesson planning, for performance assessment and self-evaluation, as well as for introducing pupils to artificial intelligence. Teachers should view ChatGPT as a support, but by no means a substitute for their creativity, critical thinking, and innovative ideas. A successful application of this language model is to use it but with a critical observation of its potential and limitations. For AI to be effectively utilized in education, it is crucial to prioritize privacy and security, environmental impact, and ethical considerations (Khoso, Ali & Aslam, 2023). A particular concern is the protection of user data. Inadequate protection or unethical use of data can lead to misuse or unauthorized access to pupil information. Therefore, it is essential to implement appropriate security and privacy measures when using AI tools with children (Adams et al., 2023). Additionally, there should be critical reflection on the ethical and pedagogical aspects of AI (Álvarez-Herrero, 2024). Research reveals that teachers have limited knowledge about AI and how its potential benefits in practice, but they view it as an opportunity for education (Chounta et al., 2022). Previous studies reveal numerous advantages of using AI in education, for example, teachers could increase the quality of their work using an AI-based peer tutor recommender system and in this way, and they can save time for other activities (Ma, Hwang & Shih, 2020). AI can be integrated into instructional technologies such as chatbots, and AI-based chatbots could provide a personalized and adaptive learning experience (Clark, 2020; Chen, Chen & Lin, 2020; Strzelecki, 2024). Chatbots function as conversational or virtual agents for teachers and pupils and they can interact with chatbots through voice, text, pictures, and video inputs (Luo, Tong, Fang & Qu, 2019).

The potential applications of artificial intelligence in the field of education were discussed in the domains of learning, teaching, assessment and administration, and learning outcomes from the perspectives of pupils and teachers (Chiu et al., 2023). It is crucial to focus on developing the skills of future preschool and primary school teachers to effectively use AI in the field of education, because they and the young generation must build an attitude, appropriate knowledge, and skills that will help them use artificial intelligence as a learning tool, instead of relying only on her abilities. We consider this question particularly important because the research of knowledge and application of AI in the initial education of preschool and primary school teachers is not a sufficiently researched topic (Celik et al., 2022). It is very important for teachers to achieve developed competencies to understand and estimate results obtained using tools based on artificial intelligence (Celik, 2023). Teachers should be trained to use new technologies based on AI and they should be familiar with the latest innovations in the area of education, so they could use ChatGPT. It has the potential to transform even kindergarten education, providing teachers with adequate training on how to utilize ChatGPT effectively (Su & Yang, 2023b). In new teaching technology, we are trying to avoid reproductive teaching and memorizing facts, so we have more time for the development of lasting and purposeful skills that futuristic humanity would need (Gill et. al, 2024). The students at the Faculty of Education in Belgrade who are pursuing masters and doctoral studies are taking a modern approach to teacher education by incorporating the latest technology. This provides them with the opportunity to enhance their digital competencies and prepare for future digital challenges in education (Stoković, Matović, Ristić, 2023). A recent meta-analysis of papers on the impact of ChatGPT in education revealed that it serves various functions such as supporting pupil learning by answering questions, summarizing information, encouraging collaboration, checking concepts and preparing to answer, helping with drafting, as well as providing feedback (Lo, 2023). Additionally, the application of ChatGPT-enhanced instructional design is shown to reduce learning anxiety and improve learning performance, motivation, and sustained learning habits (Ng, Tan & Leung, 2024).

Due to inadequate and excessive use of modern technology, digital addiction can occur. Studies on the effects of digital addiction on children and adolescents have shown that problems can arise in various areas, including physical issues, such as potential vision or hearing impairments, muscle pain, or obesity, to cognitive (memory, problem-solving ability) to socio-emotional in terms of aggressiveness, anxiety, and problems in social functioning (Lemmens, Valkenburg, Peter, 2011; Jeong, Kim Lee 2016; Aziz et al., 2021; Şenol, Şenol, Can Yasar, 2023). Looking at the possibilities of ChatGPT, one of the leading AI applications, university professors and doctoral students believe that there will be a change in our habits regarding implementation and evaluation in education (Firat, 2023). It is important to explore and find ways to overcome potential problems that have been observed so far. Specifically in the field of education, potential problems associated with the use of ChatGPT include limited knowledge updating, as "ChatGPT may not have information about the world after 2021", the risk of generating incorrect or false information, and the possibility of plagiarism due to inadequate use of the application (Lo, 2023). There is also the potential risk of impairing critical thinking skills (Yu, 2024). At this stage of development, ChatGPT still needs to be assisted by human judgment due to a lack of critical thinking, generation, accuracy, and critical evaluation (Ignjatović & Stevanović, 2023).

METHOD

The Report on Smart Education in the Republic of Serbia (Mandić, 2023) emphasizes strategies for the development of digital pre-university education in Serbia. The focus will be on supporting pre-university educational institutions to enhance the digital competencies of pupils and education employees through the integration of ICT in teaching and learning. Achieving this goal requires researching the current knowledge and attitudes of all stakeholders in education, followed by the implementation of tailored systemic measures. The study aimed to assess the awareness and attitudes of students at the Teacher Education by evaluating their responses regarding the application of artificial intelligence, specifically ChatGPT, in their work.

The tasks were as follows:

1. Investigate whether students know what ChatGPT is, whether they have experience using it, and what it was like.
2. To investigate whether students for professional preparation would prefer to use ChatGPT to other sources.
3. To examine whether the students in the offered methodical texts can recognize the section written by a human compared to the section generated by ChatGPT.
4. To discover students' perceptions of how ChatGPT can help them in their work.
5. To determine whether under the influence of the application of texts generated by ChatGPT students can improve their responses.
6. To determine the level of students' attitudes towards the responses generated by ChatGPT.

The study included 55 fourth-year students from the Faculty of Education at the University of Belgrade (Serbia), who are actively engaged with the topic of education and pedagogical approaches.

Their perspectives can provide valuable insight into the potential benefits and challenges that Chat GPT may bring to the classroom. Relying on existing literature ([Zawacki-Richter, Marín, Bond, Gouverneur, 2019](#); [von Garrel & Mayer, 2023](#); [Robledo et al., 2023](#)) and prior knowledge, a survey questionnaire was developed. A combination of quantitative and qualitative methods was used to collect data on students' prior knowledge, experiences, and attitudes toward the quality of responses generated by ChatGPT. In the following text, we will present and analyze the obtained data.

The instrument was a questionnaire with an associated scale of attitudes. It contained questions asking students to define what ChatGPT is and answer where they learned about it, whether they had ever used it, and for what purposes. The instrument contained methodical questions such as "A pupil in the group refuses to do the assignment from Social, Environmental and Scientific Education. What should I do?", then "How should I prepare to go to the theatre with pupils?", as well as "A pupil shows signs of sadness, how can I cheer him up?", and then short texts composed in response to the mentioned questions by the teacher or ChatGPT. The task was to recognize whether they were written by humans or generated by artificial intelligence. The next segment of the instrument contained a space in which the students were asked to briefly write the course of an imaginary lesson on the topic of Farm Animals, respecting the methodical procedures they had learned about in previous schooling. After that, they had an additional space in which they answered again to the same question again, but this time with the help of ChatGPT. The same procedure was applied once again, but this time the methodical question was about solving an imaginary conflict situation in which one pupil accidentally tore the notebook of another pupil from the class. Students first wrote a detailed description of the proposal to act as a teacher in that situation using their previous methodological knowledge and then answered the same question again with the help of an additional tool - ChatGPT. In the end, the instrument contained a five-point attitude scale of five items, whose Krombach's alpha reliability was 0.81. The first item was negatively oriented (which was taken into account when scoring) and read "ChatGPT generated responses that are not precise enough". The rest of the items were positively oriented and on a five-point scale, respondents assessed how accurate (complete, comprehensive), methodically well formed, expressed in clear and easily understandable sentences, and meaningful the received responses were.

RESULTS AND DISCUSSION

The first question we were interested in was whether the students knew what ChatGPT is if they had any experience using it, and what that experience was like. From the results, it can be seen that a quarter of the respondents were unable to choose the response that precisely defines ChatGPT from the options provided. 41.8% of the respondents learned about this language model through friends or acquaintances, 32.7% through social media, and only 5.5% through education. Only 38.2% of the respondents personally used it. In a similar study, it was pointed out that more than half of the students

(62.7%) used ChatGPT, while 37.3% did not. On the other hand, a significant number of professors are familiar with the concept of ChatGPT and most of them use it in their practice (Klarin & Livaić, 2023). To prepare for professional practice in preschools or primary schools, more than three-quarters of the students indicated that they would rather use a search engine, with only 12.7% choosing ChatGPT. The reason for such a small percentage of students who would like to use this model is surely the insufficient knowledge of the ways and possibilities of its use, which represents a significant guideline for modifying existing university course programs. In some other previous research it was discovered that teachers can profit from AI during different activities of planning (to adapt the appropriateness of their learning content to their students' abilities and needs), implementation (to reduce their workload; to give immediate feedback; to decide about the relevant tasks for students based on their specifics; to track learning achievements; to make teaching process stimulating and to increase interaction), and assessment (Celik et al., 2022).

In the next step, students were shown three methodical questions with two short answers to each of them. Their task was to determine whether a human or artificial intelligence composed each of the six answers. The recognition success of the offered texts is given in Table 1.

Table 1. Success in recognizing responses generated by ChatGPT

Number of correctly recognized answers	Percentage of respondents
0	7.3%
1	1.8%
2	27.3%
3	3.6%
4	27.3%
5	5.4%
6	27.3%

It can be concluded that only a small number of students were unable to recognize whether the response was provided by a human or artificial intelligence. Additionally, 60% of students were able to make at least four correct recognitions, indicating that they can distinguish between responses from humans and AI. This suggests that they can identify when a pupil's work lacks independent effort to develop the desired competencies but is simply taken from ChatGPT without critical review and deeper analysis. Students need to understand that at this stage of AI development, synthesized responses should not be automatically considered correct, but should be critically evaluated and used in a balanced manner to minimize potential disadvantages that may occur due to inadequate use of this application. To address the potential shortcomings of AI in education, university professors must be able to differentiate between student responses and those generated by artificial intelligence, especially in cases of unethical behavior. In this regard, researchers indicate that university professors do not know whether students use ChatGPT, while 41.4% believe that students use this tool to write term papers (Klarin & Livaić, 2023). The next thing we asked the students was to describe in detail whether and how they think ChatGPT can help them in their work. Their answers were assessed and categorized. Based on the analysis of the obtained results, the following categories of answers were distinguished (Table 2).

Table 2. Students' opinion on how ChatGPT can help them in their professional work

Categorized answers	%
To check the accuracy of their responses	12.7
For new ideas, expanding information, additional content	78.2
To consolidate information	9.1

The results indicate that students cannot fully rely on the accuracy of the generated responses, but that they see them as an opportunity to generate new ideas. One study involving professors and students from the teacher education department indicated that both groups share their opinions on the advantages of ChatGPT in academic settings, highlighting the storm of ideas, the creation of an initial draft, and quick explanations on certain topics. Furthermore, the importance of collaboration and training is highlighted, as the constant help to properly integrate AI in teaching. However, one drawback identified was the challenge of maintaining attention (Khosro, Ali, Aslam, 2023). In a similar study, it was shown that students most frequently use ChatGPT for general information and mostly trust artificial intelligence, while a small number of 9.4% did not trust ChatGPT at all. This indicates a need to increase awareness and understanding of artificial intelligence, as the majority of students (72.5%) are not familiar with other AI tools (Klarin & Livaić, 2023).

In recent research, experts have assessed the degree to which we can rely on the accuracy of the responses generated by this type of artificial intelligence at the moment. The findings indicate that in the field of medicine, ChatGPT generated largely accurate information for diverse medical queries but with important limitations (Johnson et al., 2023). In a meta-analysis of papers that investigated ChatGPT's performance across subject domains, it was observed that they vary a lot from outstanding in economics, and satisfactory in programming to unsatisfactory in mathematics (Lo, 2023). Although ChatGPT is sometimes unreliable, people still plan to use it (Amaro, Della Greca, Francese, Tortora & Tucci, 2023).

In the next stage of the research, we wanted to determine if students could improve their responses under the influence of texts generated by ChatGPT. First, the students were asked two methodological questions to which they gave descriptive responses without using artificial intelligence, and then the responses were improved using ChatGPT.

Specifically, in Task 1, students were asked to briefly describe a lesson plan about Farm Animals, respecting the appropriate methodical steps they had learned about during their studies.

In Task 2, they were offered the help of ChatGPT, which generated text, related to this problem and they recreated the lesson plan on the same topic, but now they had the help and ideas of this artificial intelligence.

Task 3 describes a situation in which one pupil accidentally tore the notebook of their classmate, and the request was to write how they, as future teachers, plan to resolve the described conflict between pupils.

In Task 4, they were offered the help of ChatGPT to resolve this conflict and were asked to now write again how they would approach the resolution of the pupil's conflict.

We scored the answers and analyzed them to determine whether the students were able to improve their responses by using the texts generated by ChatGPT.

The results indicate a numerical increase in the mean value of the responses obtained using artificial intelligence (Table 3).

Table 3. The numerical increase in the mean value of responses obtained through ChatGPT

Task Type	N	M	SD
Task 1	55	1.81	1.00
Task 2	55	1.87	1.26
Task 3	55	1.85	0.85
Task 4	55	1.95	1.30

This suggests that students provide more meaningful and quality responses under the influence of the use of this modern technology. Furthermore, this implies that there can also be a practical improvement in their educational work at school. Another domain where artificial intelligence can improve the quality of learning is the adaptation of materials to the needs of pupils, their knowledge, and skills. The improvement of responses was also observed in other research, and ChatGPT successfully adapted the content of the school material to the knowledge and skills of pupils divided into primary, secondary, and advanced groups, which resulted in positive experiences and better quality of learning for children from four to six grades (Jauhainen & Guerra, 2023).

After all the questions and tasks that the students solved regarding ChatGPT, we were interested in determining the level of attitude of our respondents towards the responses generated by this language model. The scale with which we determined the level of students' attitudes toward the quality of responses generated by ChatGPT was measured by an instrument created for this research. The Likert-type assessment scale, with Cronbach's $\alpha > 0.81$, had five items. The first was negatively oriented, and the rest were positively oriented (Table 4).

Table 4. Students' attitude toward the quality of responses generated by ChatGPT

Attitude - ChatGPT generated responses that were		N	M	SD
1.	Insufficiently precise	55	3.62	1.18
2.	Accurate, complete, comprehensive	55	3.56	0.96
3.	Methodically well-formed	55	3.40	1.13
4.	Expressed in clear and understandable sentences	55	4.07	0.94
5.	Meaningful	55	3.89	0.94
Cronbach's $\alpha > 0.81$				

On the scale of attitudes (1-5), the average value expressed by the respondents about the considered aspects of using ChatGPT was 3.71. Previous research suggests that the successful implementation of new teaching technologies depends on the attitudes of the teachers (Fernández-Batanero, Román-Graván, Reyes-Rebollo, Montenegro-Rueda, 2021), and in that context, the obtained value of the attitude of our respondents can indicate that there are opportunities for further successful training of students in this domain. It is important to note that the teacher's active participation is necessary for effective use of this language model. Purposeful use needs to be ensured, including iterative feedback

loops between ChatGPT, human instructors, and pupils, along with the awareness that there are potential challenges and pitfalls (Strzelecki, 2024).

CONCLUSION

Having seen the perspectives of students on the use of ChatGPT in education, we have concluded that University teachers can and must improve their competencies for more efficient integration of artificial intelligence in the education of future teachers. At this point, however, most of our students wanted to find information through an internet browser, instead of using ChatGPT. Such an attitude is expected because a very small percentage of students are informed about the working methods and possibilities offered by other artificial intelligence software such as Microsoft Copilot and Google Gemini. Sporadic and non-institutional information was provided on this topic, and during the research itself, in which the quality of student work improved under the influence of the application of this tool, they saw how it could be used purposefully. We can conclude that artificial intelligence is developing its potential in almost every field of work, including education. Care should be taken to avoid excessive use of artificial intelligence tools, which can lead to various forms of technology addiction in pupils. Spending too much time interacting with AI systems instead of engaging in other activities can negatively affect physical, emotional, and social development. Artificial intelligence cannot replace the teacher in the development of pupils' basic competencies, but it can be a strong support, leaving more time for teachers to work with pupils, develop critical thinking and creative potential, and value attitudes and character traits. With the advancement of technology, the teaching profession is facing increasing challenges. Pupils are increasingly digitally empowered and expect learning to be adapted to the technological innovations they are growing up with. Artificial intelligence has become a key tool in education, opening up new possibilities for improving the teaching process and improving the learning process. Faculties dealing with teacher education must not allow themselves to be slow in adapting to new changes but educate competent teachers who will have the knowledge, skills, and motivation to properly use modern educational technologies. We need to design a well-balanced approach that utilizes the benefits of AI while minimizing the above-mentioned potential drawbacks that may occur due to inadequate use of this application. Given that it is also suitable for use at the university level, there must be a precaution regarding abuse and the appearance of plagiarism when taking exams, which has also been mentioned in several other publications, so it is necessary to devise a way to prevent it. Therefore, artificial intelligence offers a wide range of activities that can encourage pupils to think critically and to obtain information through interaction and an active approach to learning, leaving teachers more time for educational work, complex evaluation of pupil work, and encouraging pupil motivation for constant innovation of competencies in following the needs, possibilities in the time ahead.

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Vrednovanje kvaliteta odgovora koje je generisao ChatGPT

Sažetak:

Tradicionalni modeli obrazovanja postaju zastareli i suočavamo se sa izazovom korišćenja veštačke inteligencije koja podrazumeva prilagođavanje nastavnih metoda, pojavu novih sredstava i upotrebu novih tehnologija. U dosadašnjim istraživanjima utvrđeno je da ona može da dovede do dobrobiti koje se odnose na personalizaciju obrazovanja, poboljšanje kvaliteta nastave, praćenje napretka u učenju, unapređenje alata za učenje, povećanje motivacije. Predstavljanje ChatGPT-a, kompanije OpenAI, od samog početka privlači pažnju različite populacije. Smatramo da je za savremenog učitelja veoma važno da prati inovacije i prilagođava nastavu novim generacijama učenika, te smo stoga nastojali da u ovom istraživanju istražimo vrednovanje kvaliteta odgovora u oblasti obrazovanja koje je generisala ova aplikacija podržana veštačkom inteligencijom. Na osnovu saznanja dobijenih proučavanjem relevantne literature kreirali smo upitnik na koji su odgovarali studenti završne godine Fakulteta za obrazovanje učitelja i vaspitača Univerziteta u Beogradu (Srbija). Najpre nas je zanimalo da utvrdimo kakva su dosadašnja iskustva budući učitelji imali sa korišćenjem ChatGPT-a, zatim smo procenili u kojoj meri je korišćenje ChatGPT-a doprinelo njihovom radu. Pružili smo mogućnosti da kritički procene kvalitet odgovora na postavljena pitanja posredstvom ove aplikacije, a na kraju i da izraze svoje stavove prema kvalitetu odgovora koje je generisao ChatGPT. Dobijeni rezultati su izloženi i prodiskutovani. Iako je većina naših ispitanika čula za ovu aplikaciju, iskustva koja su imali nisu bila planski stečena s ciljem njihovog profesionalnog usavršavanja, te je to prostor za unapređivanje programa njihovog institucionalnog obrazovanja. Studenti su iskazali motivisanost i spremnost da procenjuju mogućnosti korišćenja ovog jezičkog modela i uče kako da ga iskoriste uz svest da veštačka inteligencija ne može zameniti njihovu ulogu, ali da je postala ključan alat u obrazovanju čime im otvara nove mogućnosti usavršavanja nastavnog procesa i unapređenja procesa učenja.

Ključne reči: veštačka inteligencija; ChatGPT; stavovi učitelja; unapređivanje obrazovnog procesa; benefiti AI