

## COMPARATIVE ANALYSIS OF UTILIZING POPULAR INTELLIGENT COMPUTER SYSTEMS IN EDUCATION

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**Abstract.** Intelligent computer systems have indeed experienced rapid development in recent years. The penetration of artificial intelligence in almost all spheres will certainly change some professions. In the educational sphere for the use of the artificial intelligence are also required new digital competencies and skills that must be mastered by teachers in order to be successfully used for learning and teaching.

A comparative analysis with various indicators of popular intelligent computing systems are made in the report and the possibilities for their use in the educational process are discussed. The results from study of readiness and attitude to use artificial intelligence systems of professors, teachers, students and doctoral students are presented. The results of the survey, which confirm the need to raise awareness of the possibilities of AI and to conduct more practical training to acquire digital competences and skills to use AI in education, are discussed in the paper.

**Keywords:** intelligent computer systems; artificial intelligence; digital competences; education

### 1. Introduction

Intelligent computer systems will certainly change the work environment and lead to the disappearance of some traditional professions. New jobs will emerge and will require new digital competences and skills. For example, in the field of autonomous and robotic systems development (Kunze et al. 2018; Chen, et al. 2022), we will need engineers and technicians to design, install, maintain and operate these systems. In the fields of e-commerce, we will need software engineers to use artificial intelligence to personalize customer offers and predict their behaviour (Khrais 2020; Kalia 2021). In medicine, artificial intelligence will be used to diagnose diseases, to plan treatment and to manage hospitals (Lee et al. 2021). As a result of digitalization and the implementation of artificial intelligence, students will be trained for new professions (Ivanova 2023; Shaukat 2020; Hristov 2023),

such as: machine learning engineer, data scientist, robotics specialist.

In the educational sphere, the use of artificial intelligence will also require new skills that must be mastered by teachers and students in order to successfully use AI for learning and teaching (Liua et al.; Ahmad 2021). Teachers and students need to be taught new kinds of skills, such as how to effectively use semantics in artificial intelligence [Baeva et al., 2019] using better communication with AI and learn how to implement prompt engineering (Eager 2023; Spasić 2023).

## 2. Comparative analysis of popular systems with AI

A comparative analysis with various indicators of popular AI chat bots are made in Table 1.

**Table 1.** A comparative analysis of popular AI chat bots

Indicator	Chat GPT 3.5	Google Bard / Gemini	Bing Chat / Copilot
Company	Open AI	Google	Microsoft
Officially launched date	November 2022	March 2023 / Gemini 2023	February 2023 / Copilot 2023
Database	Trained with fixed dataset	Trained with a specific set of data, but provide also data for current information using google search engines. Gemini is trained on a larger database.	Uses an enhanced version of Chat GPT and searches the internet for current data. Copilot is powered by the latest GPT 4.0 models.
Price	Free version is limited to 30 messages hourly and 50 messages every three hours. For \$20 per month offers faster response and access to new features in Chat GPT-4.	Free version	Basic use is still free. Limitations: 30 chats per session and 300 chats daily. Anonymous session has a limit of five chats.
Conversation style	No options in the chat, but in conversation style can be defined	No options in the chat, but in conversation style can be defined	Three conversation styles options in the chat: creative, precise and balanced style, which combines the best of both
Images	A text model that cannot visualize and recognize images	Can recognize images and visualize images from google search but cannot create images with AI	Can recognize images and generate images with AI but cannot view real photos from the internet in chat

Data sources links in the reply	No links to sources in reply	With links to sources in reply	With links to sources in reply
Word and character limitations in question and answer	The free version has a limit of 4096 characters in the question and 2048 in the answer.	No character limit for prompts.	Question length limit - up to 4000 characters
Tasks solving	Errors with calculations with fractions using dots or commas	Solves tasks with fractions without need to specify that it is fraction	Solves tasks with fractions without need to specify that it is fraction
Classifying information in tables	Good visual classification in a table but doesn't generate many criteria	Good visual classification in a table with many criteria	Good visual classification in tabular form with information on the origin of the text and option to edit the table in Excel
Audio	Audio playback functionality available in chat	Audio playback functionality available in chat	Audio playback functionality available in chat
Video	No video functionality available in chat	No video functionality available in chat	No video functionality available in chat

### **3. Applications of AI in education**

Applications of using AI in the educational process are discussed for students, teachers and schools. For students: Personalized learning - individual study with own pace and with appropriate study materials, considering own strengths and weaknesses to improve specific achievements; Adaptive learning – optimizing education resources and supporting fast education process; Fast and automate assessment feedback – faster and accurate student assessment with possibility to compare and analyse students' achievements; Virtual classes with AI – AI can be used for online education facilitating the perception of complex concepts, planning the educational process in time and etc.

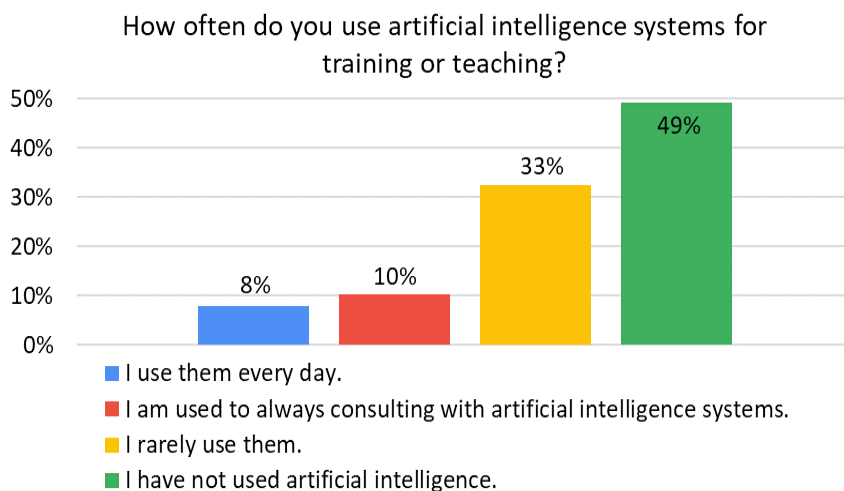
For teachers: Creating learning materials – generating a lesson plan, generating learning content on specific topics from the curricula, etc.; Personalization of learning materials – for learners with specific educational needs (SEN), for advanced learners, personalized testing, etc.; Detection of grammatical and stylistic errors in the study material – correction of texts, students essay review with AI; Assisting with administrative work – generating a scenario for a holidays in schools, generating templates for emails to parents on various occasions (parent meeting and etc.); Structuring and summarizing

a large volume of educational material – extracting keywords, classifying information in tables, etc.; Clarification of new terms with concrete definitions and examples, clarification of case studies; Test questions and tests generator based on a large volume of study material – group and individual tasks on specific topics, etc; Help with critical analysis of educational texts – assessment criteria advices.

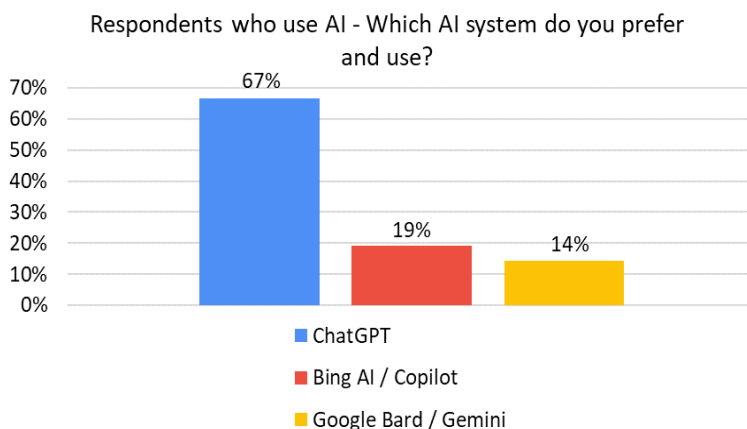
For schools and universities: Smart classrooms – adaptable environment and access for students with SEN helping them to find things and places in the classroom with many sensors, with many possibilities for interactions with students and teachers; Smart buildings – saving energy resources, more efficient use of building space, improving students and staff safety.

#### 4. Survey Results

A survey has been created to provide the current research with results data for readiness and attitude to use artificial intelligence systems of more than 500 participants: professors, teachers, students and doctoral students. Survey respondents are as follows: 242 school teachers (47,5 %), 136 university professors (26,7%), 52 students and pupils (10,2%), 27 doctoral students (5,3%) and 57 others. 49% of survey respondents answer that they did not use artificial intelligence, only 18% answer that they used to use AI every day and consulting with it (Fig.1). Fig. 2 shows that 67% of those respondents who use AI prefer using ChatGPT.



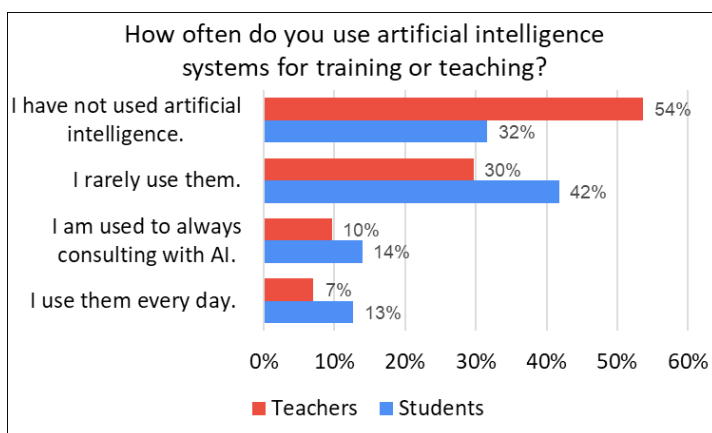
**Figure 1.** How often do you use artificial intelligence systems for training or teaching?



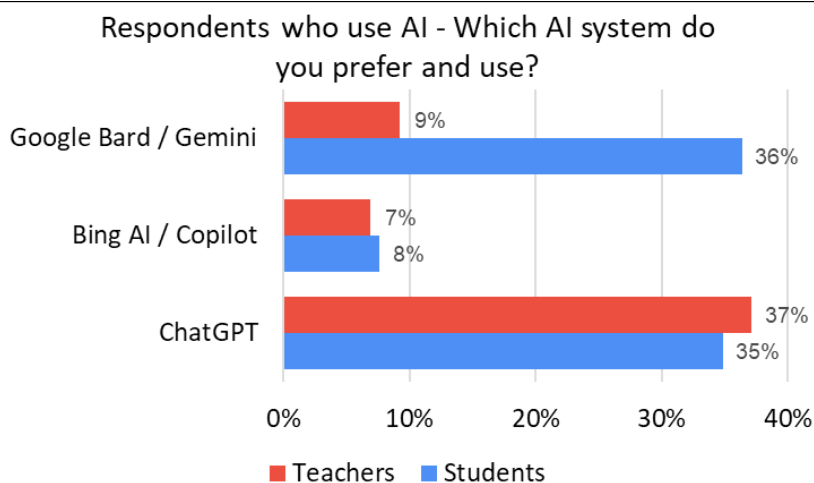
**Figure 2.** Which AI system do you prefer and use?

Fig. 3 and Fig. 4 presents comparative analysis with students and teachers' responses. Only 30 % of students on Fig.3 response that they do not use AI, while the percentage of teachers who do not use AI is bigger – 55%. On Fig. 4 38% of those students' respondents who use AI prefer Google Bard/Gemini, while 37% of teachers who use AI prefer ChatGPT.

On Fig. 5 246 respondents have positive attitude towards using artificial intelligence systems to improve learning and teaching and only 117 respondents have a negative attitude.



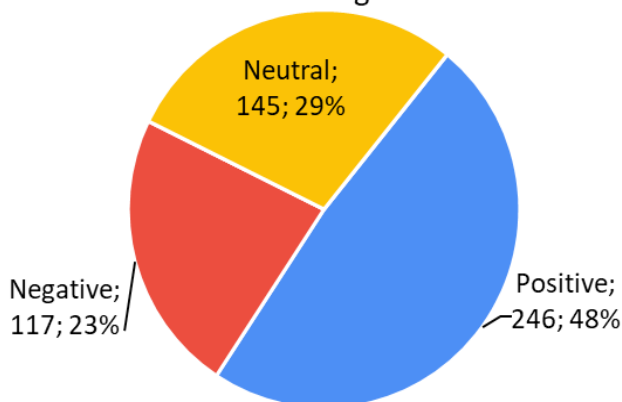
**Figure 3.** How often do you use artificial intelligence systems for training or teaching? – students and teachers' responses



**Figure 4.** Which AI system do you prefer and use? – students and teachers’ responses

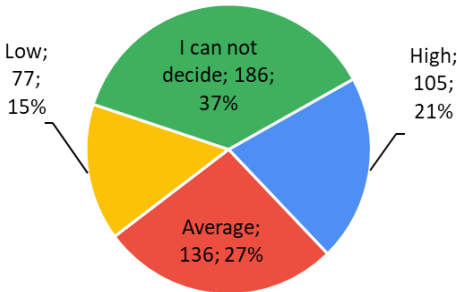
The results on Fig.6 shows that 37% of the respondents do not have a firm opinion, most likely due to a low level of awareness about the capabilities of AI.

What is your attitude towards using artificial intelligence systems to improve learning and teaching?



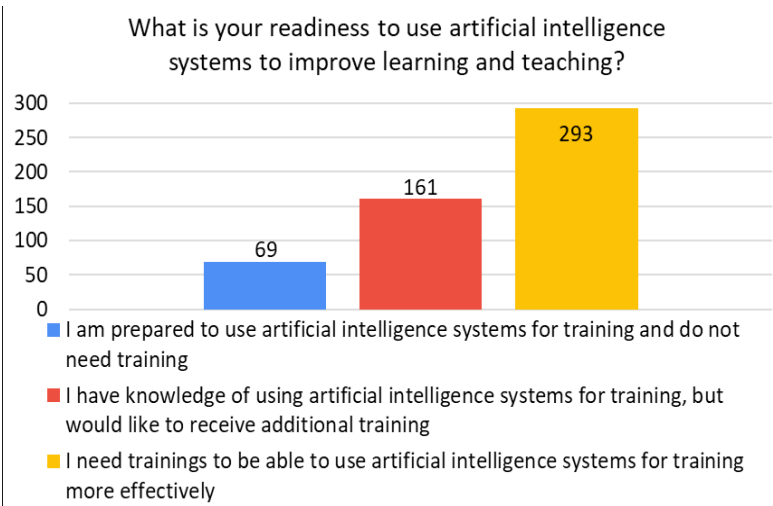
**Figure 5.** What is your attitude towards using artificial intelligence systems to improve learning and teaching?

What is your assessment of the capabilities artificial intelligence systems provide to improve learning and teaching?

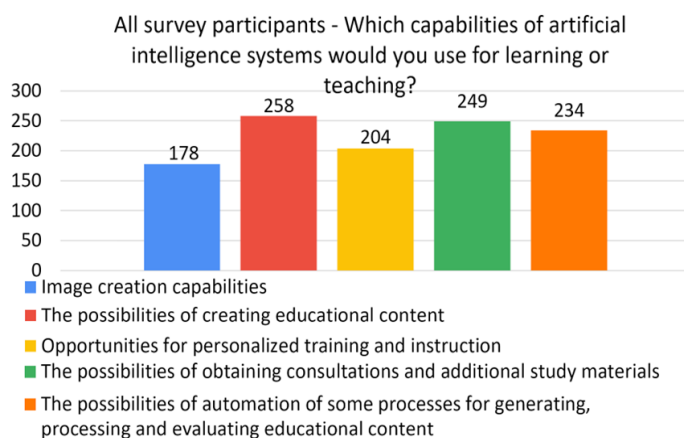


**Figure 6.** What is your assessment of the capabilities artificial intelligence systems provide to improve learning and teaching?

The data from Fig. 7 indicate that 424 out of 523 (87%) respondents feel they need training. This clearly shows the acute need for training professionals on how to properly use AI in their practical work. The results from Fig. 7 also confirm the conclusion drawn from the data in Fig. 6, that respondents need more awareness about the capabilities of AI.



**Figure 7.** What is your readiness to use artificial intelligence systems to improve learning and teaching?



**Figure 8.** Which capabilities of artificial intelligence systems would you use for learning or teaching?

Fig. 8 presents results about which capabilities of AI respondents would use.

258 respondents on Fig. 8 will use AI possibilities of creating educational content. 249 will use possibilities of obtaining consultations and additional study materials. 234 prefer to use AI for personalized training and instruction.

## 5. Conclusions

The conclusions that can be summarized from the analysis of the results of the conducted survey among over 500 professors, teachers and students are:

- Only 18 % of survey respondents use AI almost every day, but 49 percent say they have not used AI. The comparative analysis shows that students more often use AI than teachers. The results of the survey confirm the need to raise awareness of the possibilities of AI and to conduct more practical training to students and teachers to acquire digital competences and skills to use AI in education process;

- The most preferred AI system to use among respondents was ChatGPT, followed by Bing/Copilot. The least popular among respondents is Bard/Gemini. The comparative analysis shows that students prefer Google Bard/ Gemini, while teachers prefer ChatGPT.

- 48% of respondents have a positive attitude towards the use of AI in education, only 23% have a negative attitude. Artificial Intelligence is still developing in an educational context, and like every new technology that develops, it is important to be used in the classroom under the supervision of educators. Artificial intelligence should be used as advisor and should not be given a controlling role in our life.

- Based on all the responses on Fig.6, it can be concluded that there is no clearly formed opinion among those interviewed, most likely because these technologies



are too new and unfamiliar to the majority of the respondents.

– All respondents in survey indicated that they needed additional training. The most requested trainings indicated by the respondents are related to AI capabilities for creating educational content, processing and evaluating educational materials, opportunities for creating presentations.

Artificial intelligence can have many applications in education. It can help personalize the educational process by adapting learning material according to the specific needs and preferences of learners. This can significantly improve learners results and increase their motivation to study.

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### **REFERENCES**

- AHMAD, S. F.; RAHMAT, M. K.; MUBARIK, M. S.; ALAM, M. M. & HYDER, S. I., 2021. Artificial intelligence and its role in education. *Sustainability*, vol. 13, no. 22, p. 12902. <https://doi.org/10.3390/su132212902>.
- BAEVA, D.; BAEV, B., 2019. Semantic approach in encoding of the meanings in Bulgarian Folklore embroidery in digital libraries. In: *2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO). IEEE*, pp. 1082 – 1086.
- CHEN, J., SUN, J., & WANG, G., 2022. From unmanned systems to autonomous intelligent systems. *Engineering*, vol.12, pp. 16 – 19. DOI:10.1016/j.eng.2021.10.007.
- EAGER, B., & BRUNTON, R., 2023. Prompting higher education towards AI-augmented teaching and learning practice. *Journal of University Teaching & Learning Practice*, vol. 20, no. 5. DOI: <https://doi.org/10.53761/1.20.5.02>.
- HRISTOV, G.; BELOEV, I. & ZAHARIEV, P., 2023. Challenges, Requirements, Opportunities and Solutions for The Digital Transformation of the Transport Education. *Strategies for Policy in Science & Education/ Strategii na Obrazovatelnata i Nauchnata Politika*, vol. 31, no. 4s, pp.155 – 167. <https://doi.org/10.53656/str2023-4s-13-cha>.
- IVANOVA, A.; IBRYAMOVA, E., 2023, The Role of Social Networks and Micro-Learning in the Digitalization of Education, *Strategies for policy in science and education-Strategii na obrazovatelnata*

- i nauchnata politika*, vol. 31, no. 4s, pp. 120 – 134. DOI:10.53656/str2023-4s-10-the.
- KALIA, P., 2021. Artificial intelligence in e-commerce: a business process analysis. In: *Artificial Intelligence*, pp. 9 – 19. CRC Press.
- KHRAIS, L. T., 2020. Role of artificial intelligence in shaping consumer demand in E-commerce. *Future Internet*, vol. 12, no. 12, <https://doi.org/10.3390/fi12120226>.
- KUNZE, L., HAWES, N., DUCKETT, T., HANHEIDE, M., & KRAJNÍK, T., 2018. Artificial intelligence for long-term robot autonomy: A survey. *IEEE Robotics and Automation Letters*, vol. 3, no. 4, pp. 4023 – 4030.
- LEE, D., & YOON, S. N., 2021. Application of artificial intelligence-based technologies in the healthcare industry: Opportunities and challenges. *International journal of environmental research and public health*, vol. 18, no. 1, p. 271. <https://doi.org/10.3390/ijerph18010271>.
- LIUA, Y., SALEHB, S., & HUANG, J., 2021. Artificial intelligence in promoting teaching and learning transformation in schools. *Artificial Intelligence*, vol. 15, no. 3. DOI:10.53333/IJICC2013/15369.
- SHAUKAT, K.; IQBAL, F.; ALAM, T. M.; AUJLA, G. K.; DEVNATH, L.; KHAN, A. G. & RUBAB, A., 2020. The impact of artificial intelligence and robotics on the future employment opportunities. *Trends in Computer Science and Information Technology*, vol. 5, no. 1, pp. 050 – 054.
- SPASIĆ, A. J. & JANKOVIĆ, D. S., 2023. Using ChatGPT standard prompt engineering techniques in lesson preparation: role, instructions and seed-word prompts. In: *2023 58th International Scientific Conference on Information, Communication and Energy Systems and Technologies (ICEST)*, IEEE, pp. 47 – 50.

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