

# THE IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN THE EDUCATIONAL INSTITUTIONS: EVIDENCE FROM SERBIA

Jelena Premović<sup>1\*</sup>, Vera Krmpot<sup>2</sup>, Tamara Premović<sup>3</sup>

<sup>1</sup> Faculty of Economics and Engineering Management, University Business Academy in Novi Sad, Republic of Serbia, e-mail:

[jelena.premovic@gmail.com](mailto:jelena.premovic@gmail.com)

<sup>2</sup> Faculty of Business Studies and Law, University UNION – Nikola Tesla, Belgrade, Republic of Serbia, e-mail: [vera.krmpot@](mailto:vera.krmpot@fbsp.edu.rs)

[fbsp.edu.rs](mailto:vera.krmpot@fbsp.edu.rs)

<sup>3</sup> Faculty for information technology and engineering, University UNION – Nikola Tesla, Belgrade, Republic of Serbia, e-mail:

[tamara.premovic@fbsp.edu.rs](mailto:tamara.premovic@fbsp.edu.rs)

**Abstract:** In the knowledge society and knowledge-based economy, artificial intelligence is gaining an increasingly important role and significance. Research shows that artificial intelligence will have a main influence on the global economy through increasing labor productivity through the automation of activities, which will lead to changes in education, health care, public sector services, etc. At the same time, the accelerated development and application of artificial intelligence is causing increasing concern about possible abuses. Therefore, at the global but also at national levels, various initiatives have been launched in order to regulate questions regarding to the development and practical application of AI.

The Republic of Serbia also joined these initiatives by adopting “the Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period 2025-2030” as well as the previous Strategy for the period 2020-2025. In addition to normative and institutional regulation, activities aimed at promoting and raising citizens’ awareness of the importance of artificial intelligence in order to encourage the inclusion of population in the process of development and improvement of society are also of particular importance.

Starting from these facts, the paper analyzes the state and possibilities of using artificial intelligence in the educational institutions in Serbia. In order to determine the level of awareness of Serbian students about artificial intelligence and the perspectives of its application, an original empirical research was conducted in schools in the territory of Serbia. A total of 2.213 students participated in the survey, of which 1.512 were respondents from primary schools and 701 from secondary schools in Serbia. In addition to descriptive statistics and the technique of a structured questionnaire, the appropriate qualitative methodology was applied in this research too.

Based on the research results and their interpretation, the authors came to the conclusion that there exists a significant potential for a further implementation of AI in the educational institutions in Serbia, as well as that current practical teaching is poorly developed.

**Keywords:** Artificial intelligence (AI), education, educational institutions, primary school, secondary school, students, AI awareness.

**Field:** Social sciences - Economics.

## 1. INTRODUCTION

Artificial intelligence (AI) is becoming a key technology shaping the modern world with applications in numerous fields, primarily in medicine, industry, education, agriculture, public sector. The ability of AI to analyze large amounts of data and make quick decisions significantly improves production and business processes, thereby reducing costs and raising the quality of life.

For example, in healthcare, AI is bringing great advances in diagnosis and therapy, while in education, it enables personalized learning that is accessible to a wider range of people and helps everyone progress more easily than before. In many sectors, this technology shows the ability to transform existing work models and contribute to sustainable development.

However, in addition to significant advantages and benefits, AI also opens up a number of challenges that require careful elaboration. Ethical issues such as privacy protection, bias in algorithms and potential abuses are becoming increasingly important. In addition, there is a risk that AI-driven automation will increase inequalities, especially in less developed economies where many jobs are at risk. The lack of clear regulations in numerous countries further complicates the situation, as it enables the uncontrolled application of technology. Also, there is the issue of energy efficiency because the development and application of artificial intelligence require a large amount of energy.

In order for artificial intelligence to realize its full potential, it is necessary to solve these challenges

\*Corresponding author: [jelena.premovic@gmail.com](mailto:jelena.premovic@gmail.com)



at the level of countries, but also through cooperation at the global level. Proper regulation, investment in education and technology, and an ethical approach to development can ensure that AI is beneficial for all. Only through a balanced use of this technology can we ensure that it serves humanity, instead of becoming a source of new problems and inequalities.

An important event for the development of AI is related to the ChatGPT application that uses a large language model to generate text and through integration with multimedia generative models of other content. The application became generally available from November 2022 and very quickly found its wide use in everyday business and other activities. Intellectual property rights, business application and method of use in education are the most important issues brought about by the accelerated development of artificial intelligence.

Research shows that artificial intelligence will have a main influence on the global economy through increasing labor productivity through the automation of activities, which will lead to changes in education, health care, public sector services, etc. At the same time, the accelerated development and application of artificial intelligence is causing increasing concern about possible abuses. Therefore, at the global but also at national levels, various initiatives have been launched in order to regulate issues related to the development and practical application of artificial intelligence, from non-binding recommendations to legal solutions.

Numerous documents were adopted as a result of established international agreements and initiatives. In the United Kingdom, the "Bletchley Declaration" was adopted, where 28 countries agreed that artificial intelligence should be developed and applied in a safe, reliable and responsible way, adapted to humans. The United Nations adopted "the Global Resolution on safe, secure and trustworthy artificial intelligence systems for sustainable development". G7 members launched the so-called The Hiroshima Process aims to shape the global governance of advanced artificial intelligence systems, particularly generative artificial intelligence technologies. This process aims to ensure that artificial intelligence is developed in a way that is safe, reliable, legal and in line with the values of humanity. On March 13, 2024, the Parliament of the European Union adopted "The Artificial Intelligence Act", which uniquely regulates AI field - questions and concerns related to the development and implementation of AI. According to this law: "An artificial intelligence system is a machine-based system that, due to explicit or implicit goals, derives from the input it receives a way to generate outputs such as predictions, content, recommendations or decisions, which can affect physical or virtual reality". (Strategy, 2025)

In addition to these national and interstate documents, many companies are making their own rules regarding how to develop and implement AI to ensure safety, security, and good and responsible use of artificial intelligence.

## 2. LITERATURE REVIEW

The application of different paradigms and techniques such as machine learning, deep learning, neural networks and the like, has made it possible to use machines in such a way that they can process large amounts of different data, taking into account the changes that are happening at a given moment and form answers or proposals based on this, or make conclusions and predictions that seem as if they were designed by humans. Today, we call such an ability of machines "artificial intelligence".

If some political and economic incentives "remain the primary drivers of the development of AI and other digital technologies, as Ionescu (2024) notices, the digital gap between high- and low-income countries will drive a stark disparity in the distribution of related benefits – and risks".

As authors point out "the phrase "artificial intelligence" is a generic one that may be used to describe any variety of computer software that participates in tasks that are analogous to those performed by humans, such as learning, planning, and problem-solving. To refer to certain applications as "artificial intelligence" is like to referring to a car as a "vehicle"; while this is technically accurate, it does not encompass any of the nuances of the topic". (Bharadiya et al.; 2023). "The applications of Artificial Intelligence range from detecting trends in data to mitigate market risks, enhancing customer service through virtual personal assistants, or even analyzing millions of documents across a company's servers to find compliance failures. But it is only recently that companies have been able to anticipate and envision the possibilities that Artificial Intelligence and robotics can bring to the future of the business world". (Palanivelu, Vasanthi, 2020).

One of the definitions of artificial intelligence was proposed in November 2023 by the OECD: "An artificial intelligence system is a machine-based system that, based on explicit or implicit goals, draws conclusions from received data, in order to generate output information such as predictions, content, recommendations or decisions that can affect the physical or virtual environment". (OECD, 2023).

The rapid advancements in science and technology worldwide are bringing about significant transformations in many facets of life, including education. Addressing AI-related anxiety is crucial for fostering an inclusive and supportive learning environment. Students experiencing anxiety or fear about AI may exhibit hesitancy toward engaging with technology-driven educational tools or innovative learning approaches (Source: Cantaş, et al., 2024). "The application of AI in educational institutions is important because its implementation represents a reengineering of traditional teaching methods and improves the overall learning ecosystem. The author Karamanu and Goksuu (2024), emphasized that the combination of AI and catboats is important because it has led to extreme changes in the education sector, adopting a large number of applications that have been successfully implemented" (Tešić, Pavlović, 2025). The emergence of artificial intelligence (AI) influences almost every facet of education and is also accepted and valued by educators. The regular use of AI in education can be considered one of the most decisive developments of the century (Source: Julien, 2024).

Karakose (2024) emphasis that "one of the hot discussions over the exponential advancement of AI has been whether this ability of machines to accomplish tasks that require human intelligence could take over the roles of humans in the workplace and make the human workforce redundant. The field of education was no exception since AI technologies have made significant inroads into the realm of education". While the authors (Luan et al., 2020) indicate that "through gathering, analyzing, and assessing large datasets, AI-based big data analysis can extract 'actionable knowledge and viable patterns from data' by employing 'a variety of technologies and tools, such as statistical analysis, data mining, data visualization, text analytics, social network analysis, signal processing, and machine learning".

### 3. MATERIALS AND METHODS

The Republic of Serbia has realized the role of artificial intelligence in achieving socio-economic development, which is why it has joined efforts for normative regulation of this area. Namely, 10.01.2025 the Government adopted "the Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period 2025-2030" in which "the Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period from 2020-2025" ceased to be valid. "The strategy lays the foundation for the further development of the legal and institutional framework that will enable the creation of solutions for numerous ethical and regulatory challenges. This approach creates prerequisites for preventing potential abuses of artificial intelligence and ensures compliance with the ethical standards that the Republic of Serbia strives for" (Strategy, 2025, p. 2). AI is an integral part of the education process, which is also recognized in this strategy. The development of language technologies can influence that educational contents created in other languages can now be translated into Serbian much more easily and thus applied in education. In this way, the repository of tools for use in education is increased. "The Center for Robotics and AI in Education" was established within the University of Belgrade, which is a significant step in the direction of improvement and development and application of artificial intelligence in education.

In the past period, following the trends of education development in accordance with the current Artificial Intelligence Strategy, two subjects were introduced in primary and three optional subjects in secondary schools where artificial intelligence is studied. Thanks to this, the Republic of Serbia was recognized by the UNESCO as one of the 11 countries that introduced artificial intelligence at the national level in the K-12 education system.

In the part of higher education, study programs have been established that fully or largely fit into the basic curriculum, which provides undergraduate students with the knowledge and skills needed for postgraduate studies in the field of artificial intelligence. Seven master's programs in this field have been established at six faculties, and 133 students have enrolled so far. These programs are designed to follow the needs of the economy. According to the data presented in the Strategy, 600 participants went through special training programs in the field of artificial intelligence implemented by the National Academy for Public Administration. The implementation of the training "Application of ethical guidelines in the development, implementation and application of reliable and responsible artificial intelligence" is planned.

In the third quarter of 2024, the Republic of Serbia became the first non-EU country to host the prestigious Eastern European School of Machine Learning. More than 200 researchers and engineers from 47 countries attended the school. The activities of science and technology parks in Belgrade, Novi Sad, Nis and Cacak, which gather startups and innovative companies, and which at the end of 2023 had more than 250 member companies, including research and development centers of global companies with a significant number of employees, also contributed to the greater influence of the Strategy in the field of further development of the economy based on artificial intelligence.

In addition to normative and institutional regulation, activities aimed at promoting and raising citizens' awareness of the importance of artificial intelligence in order to encourage the inclusion of population in the process of development and improvement of society are also of special importance. One of the basic goals of this Strategy is "to improve primary, secondary and higher education in the field of artificial intelligence and create conditions for educating the entire population about the possibilities, limitations and risks of the AI technology".

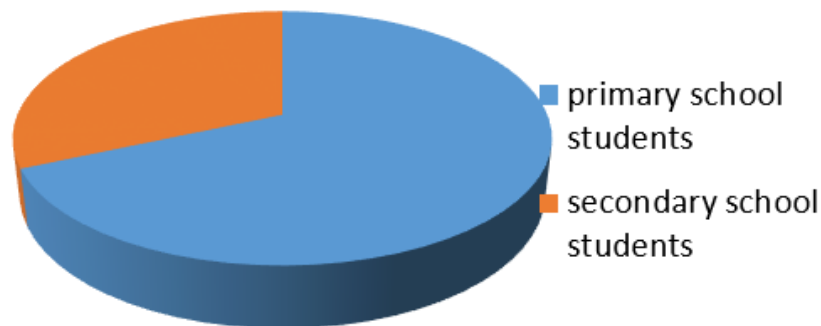
In order to determine the level of awareness of Serbian students about artificial intelligence and the perspectives of its application, an original empirical research was conducted in schools in the territory of Serbia. The research was conducted by the Center for Teaching Improvement "Abacus" from Belgrade. In addition to descriptive statistics and the technique of a structured questionnaire, the appropriate qualitative methodology was applied in this research too.

#### 4. RESULTS AND DISCUSSIONS

A total of 2.213 students participated in this survey; 1.512 respondents from primary schools and 701 from secondary schools in Serbia.

Some of the summarized results of this research based on a survey conducted through a structured questionnaire on a sample of 2.213 respondents – students from Serbian primary and secondary schools from are presented in following figure and charts as well as explanations.

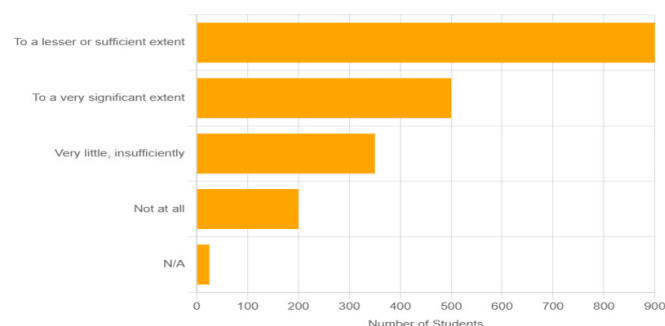
**Figure 1** Students from primary and secondary schools in Serbia



**Source:** Authors calculation based on the survey data

As can be seen in Chart 1, 53% of students were familiar with AI "to a lesser but sufficient extent". 26% of students stated that they were familiar with it "to a very significant extent" while more than 10% of students had no contact with this topic at all. Based on the data obtained from the respondents, it can be stated that more than three-quarters of students have at least some level of familiarity with AI, which indicates its widespread presence in education.

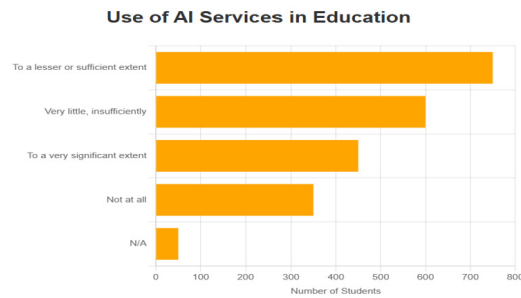
**Chart 1** Familiarity with AI



**Source:** Authors calculation based on the survey data

When it comes to the using AI for educational purposes, more than half of students actively use AI tools in school activities. Precisely 36% of students use AI "to a lesser but sufficient extent", 22% used AI "to a very significant extent". 21% did not use AI at all.

**Chart 2 Use of AI services in education**

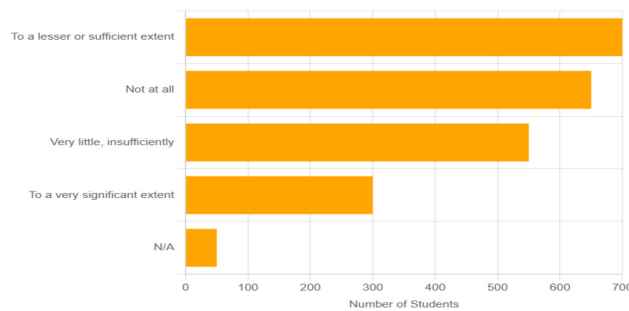


**Source:** Authors calculation based on the survey data

To the question about practical examples and application of AI at school - the results were obtained which show that only 15% of students had practical examples “to a very significant extent” and 30% of students had no contact with practical application at all.

**Chart 3 practical application of Ai in education**

**Practical Application of AI in Education**

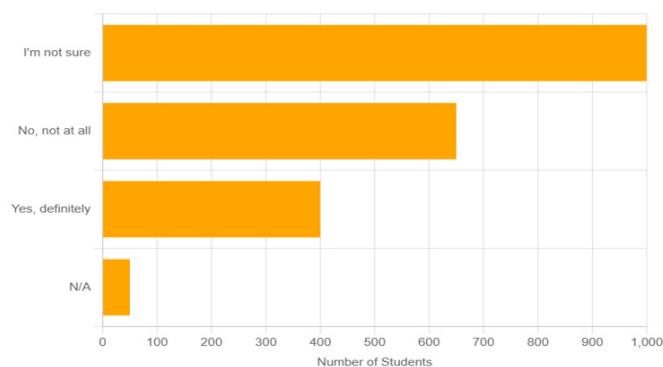


**Source:** Authors calculation based on the survey data

Are you better student because of AI? To this question most students (about 50%) are unsure about the impact of AI on success. 23% believes that they are “definitely” better students because of it.

**Chart 4 Impact of AI on Academic Success**

**Impact of AI on Academic Success**

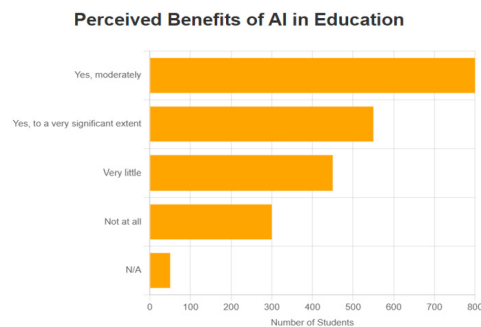


**Source:** Authors calculation based on the survey data

AI is perceived as a useful tool in the learning process by most students. There is some potential, but there is a lack of systematic education that would consolidate the belief in the benefits of AI.

To the question Does AI help in schooling - 40% of students believe that AI helps them “moderately” while 27% say that AI helps “to a very significant extent”.

**Chart 5** Perceived benefits of AI in education



**Source:** Authors calculation based on the survey data

According to the results present in the Chart 5, AI is perceived as a useful tool in the learning process by most students. There is some potential, but there is a lack of systematic education that would consolidate the belief in the benefits of AI.

## 5. CONCLUSIONS

The area of artificial intelligence is undoubtedly very interesting and significant today. When it comes to the implementation of AI in the educational institutions, some predictions show that in the times ahead, knowledge from this field will be necessary in all spheres of the educational system. According to the some predictions, more than 90% of the primary and secondary schools students will use AI during the school year by 2027. At the same time, automation will not replace learning; nevertheless it will enhance it.

Based on the results of the original empirical research, parts of which are presented in this scientific paper, it can be concluded that over 75% of Serbian students are familiar with artificial intelligence (AI), but only 15% had hands-on experience with AI in class. Also, more than half of respondents use AI independently for their studies. One of main findings of this original scientific research is that students from Serbian primary and secondary schools who participated in this research perceive AI as helpful, but not a magical solution too.

In comparison with other research such as PISA 2022 by which only 23% of students in Serbia regularly use ICT in education, results which were presented in this paper confirms great potential of AI use in Serbian educational institution. But also confirms a lack of institutional support. Therefore, it is necessary that decision-makers in the Republic of Serbia provide concrete institutional support in the coming period that will contribute to better student results in the Serbian education system regarding the sustainable use of AI in the entire learning and education process.

## REFERENCES

- Bharadiya, J.P., Thomas, R.K., Ahmed, F. (2023). Rise of Artificial Intelligence in Business and Industry, *Journal of Engineering Research and Reports*, Volume 25, Issue 3, Page 85-103, 2023; Article no.JERR.100807, DOI: 10.9734/JERR/2023/v25i3893
- Çiğdem Cantaş, Cansu Soyer, Özgür Batur (2024). Examination of Undergraduate Students' Artificial Intelligence Anxiety, Multidimensional 21st Century Skills, and Lifelong Learning Levels in terms of Various Variables, *TOJET: The Turkish Online Journal of Educational Technology – July 2024*, volume 23 Issue 3.
- Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J., Ogata, H., & Tsai, C. C. (2020). Challenges and future directions of big data and artificial intelligence in education. *Frontiers in Psychology*, 11, 580820. <https://doi.org/10.3389/fpsyg.2020.580820>
- Ionescu, L. (2024). The Future of Accounting. Implementing Artificial Intelligence in Accounting Practices'. *Annals of Spiru Haret University. Economic Series*, 24(2), 19-28, doi: <https://doi.org/10.26458/2421>
- Julien, G. (2024). How Artificial Intelligence (AI) impacts inclusive education, *Educational Research and Reviews*, Vol. 19(6), pp. 95-103, June 2024, DOI: 10.5897/ERR2024.4404, Article Number: A59EF5172309
- Government of the Republic of Serbia (2025). Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the period 2025-2030, Official Gazette of the Republic of Serbia, No. 5/2025, 17.1.2025.
- Karakose, T. (2024). Will Artificial Intelligence (AI) Make the School Principal Redundant? A Preliminary Discussion and Future Prospects. *Educational Process: International Journal*, 13(2): 7-14. <https://doi.org/10.22521/edupij.2024.132.1>
- Karaman, M.R. & Goksu, I. (2024). Are lesson plans created by ChatGPT more effective? An experimental study. *International Journal of Technology in Education (IJTE)*, 7(1), 107-127. <https://doi.org/10.46328/ijte.607>
- Palanivelu, V.R., Vasanthi, B. (2020). Role of Artificial Intelligence in business transformation, *International Journal of Advanced Science and Technology*, Vol. 29, No. 4s, pp. 392-400.
- Tešić, B., Pavlović, M. (2025). Attitudes and knowledge of the inhabitants of Serbia about AI and its technologies, *STED*.