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K-12 MODERN SCHOOLS IN SERBIA: EXPLORATORY RESEARCH REGARDING TEACHERS GENUINE KNOWLEDGE AND PERCEPTION OF AI-BASED OPPORTUNITIES AND CHALLENGES IN EDUCATION

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Abstract:

LINK Educational Alliance (LEA is an educational group based in the Republic of Serbia which involves privately owned providers of formal and informal education, the format for the development of Educational Technologies services, and Business support for their business. The exploratory research was conducted among K-12 teachers among a total population of 152 and a sample of 77 respondents (50.66%) to provide information about the perception of the teachers towards implementation of the Artificial intelligence-based solutions and the opportunities and challenges that artificial intelligence (AI) will bring into their daily activities, as well as their genuine knowledge about AI. For data analysis, we used SmartPLs Software version 3.0, making inferential and variable association analyses. The teaching process is based on the opinion of K-12 teachers regarding activities that might be automatized through AI implementation in the educational process, supported by their level of awareness and knowledge about AI. For example, AI offers opportunities to automate specific strategies and activities, which would achieve better organisation of teachers' working time and productivity and increase the share of time that teachers spend "directly interacting with students" is the central hypothesis whose validity is tested. This study aims to provide an adequate model for testing AI attitudes in the K-12 level of education in the Republic of Serbia, among teachers in elementary and secondary schools.

Keywords: Artificial Intelligence, K-12, Republic of Serbia, knowledge about AI, teachers, work composition, formal education



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Introduction

Formal education is linked to principles of cognitive growth and knowledge transfer. Although this notion has recently been challenged, these functions were once considered the essence of education. It is not abstract knowledge but what learners can do with it that is now essential. This is due to their analytical and evaluation frameworks that place real-world capability in applying and exploiting cognitive skills at the forefront. Job on adult lifelong learning has reinforced that knowledge should be relevant to work, social involvement, and real life. Competency-based education has proven to be a valuable counterbalance to a knowledge-based educational paradigm. Similarly, neuroscientific research on learning shows that competencies are developed on solid background knowledge. Smart memorisation and retrieval practice have been proved to help students master subjects. Like PISA and PIAAC, finding the correct balance between subject knowledge and thinking skills will remain a difficult task in education. There is much to gain from sharing experiences with curriculum design and implementation internationally.

Artificial intelligence (AI) generates fundamental questions about the purpose of education. AI forces us to redefine what is human about human learning and development. Understanding better the complementarity between the capabilities of computers and humans will have significant consequences for deciding what learners should learn (OECD, 2021):

- What are the domains of human activity that will not or should not be taken on by intelligent machines and algorithms?
- When many productive skills are replaced by computers, which areas will remain “human”?
- What about ordinary ethical decisions, legal judgments, medical diagnoses based on limited and sometimes contradictory evidence, or the aesthetic eye of an artist?
- How should we teach students in an AI-driven future to thrive?
- Will artificial intelligence finally provide education with the opportunity to concentrate on what makes humans genuinely human?

Teachers in high education must have the knowledge, skills, and attitudes toward technology necessary for this transition, as well as the proper institutional and administrative structures and the required equipment for students and teachers alike. However, among the other causes of the digital divide, the primary one is a lack of appropriate digital skills, which necessitates proper training (National Academies of Sciences, Engineering, and Medicine 2020).

Simultaneously, AI will radically alter the channels and procedures through which we learn. Therefore, Therefore, Therefore, OECD finds that we should harness the power of AI, big data, and learning analytics to provide more tailored and individual learning at scale (OECD, 2021).



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Digitisation and AI have the potential to profoundly revolutionise education and significantly increase productivity. Ultimately, learning results in behavioural change, and that is when learning becomes socially relevant – when knowledge, skills, character, attitudes, and values are mobilised in real-life conditions. This process does not happen automatically. We observe persons with highly developed cognitive and noncognitive talents behaving in unexpected ways in everyday life. The phenomenon of cognitive dissonance, for example, is well documented but there are many other instances in which people do not translate what they acquire internally into a behavioural change when faced with real challenges. Suppose we want to advise countries on how education in its different dimensions can contribute to solving today's and tomorrow's challenges. In that case, we cannot merely analyse comparative strengths in cognitive, social-emotional, or ethical skills. We need to understand how education may bring these disparate components together to change behaviour. This is what agency is about and why agency and co-agency are central concepts in modern education. Education can lay the foundations for this (OECD, 2021).

A study conducted by researchers Uzair and Chen look at the rise of artificial intelligence in online education teaching and learning. It investigates the implications of developing technologies on how students learn and how institutions educate, as well as how to improve performance in the online teaching platform. Recent technical developments and the accelerated use of new technologies in online education are studied. Due to COVID-19, students are unable to complete their studies on campus. As a result, the institute launched online education at the time, but students encountered several obstacles owing to a lack of techniques and resources.(Uzair, Chen, 2021)

Quang and Jiao find that AI in education faces three paradigms. Artificial intelligence (AI) has been widely used in education as computer and information processing techniques have advanced. AI in education (AIEd) creates new opportunities, potentials, and obstacles in educational procedures. AIEd has gone through multiple paradigm shifts in its brief existence, which are categorised into three paradigms in this position paper: AI-directed, learner-as-recipient, AI-supported, learner-as-collaborator, and AI-empowered, learner-as-leader. AI approaches are employed in three paradigms to solve educational and learning difficulties in various ways. In Paradigm One, AI is used to represent knowledge models and lead cognitive learning while learners get AI services; in Paradigm Two, AI is used to support learning while learners collaborate with AI; and in Paradigm Three, AI is used to empower learning while learners take the agency to learn. Overall, the AIEd development trend has been to empower learner agency and personalization, enabling learners to reflect on learning and inform AI systems to change accordingly, and leading to iterative development of learner-centered, data-driven, personalised learning(Ouyang, Jiao, 2021).



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According to McKinsey & Company's research, new technology will not be able to replace instructors in the near future. Teachers have interpersonal power that is built on emotional connection. These teachers can not only motivate their students but also teach advanced problem solving and other creative abilities, which are crucial in the educational process. The current state of artificial intelligence does not allow humans to emotionally adjust. Given that some fundamental aspects of the educational process are inextricably linked to the human character, instructors may rest assured that technology will not replace them (McKinsey, 2017).

According to McKinsey, teachers' workload is growing. Specifically, as students' demands and expectations expand in the modern world, so do the paperwork and other governmental duties that instructors must perform, most frequently manually. The results of the study showed that 81 percent of teachers in the UK are considering leaving the profession. The typical teaching week is 50 hours long. Worse, teachers spend less than half of that time directly interacting with students. Currently, 20-40% of teaching time is spent on activities that can be automated using existing technologies. This implies teachers would have an extra 13 hours per week to devote to activities that benefit students and increase teacher satisfaction. AI may be used in education to save time and improve instruction, the results proved these theses. With the use of modern technology, instructors might devote 20-40% of their time to tasks that directly benefit students: AI frees instructors to do what they love - teach. Technology saves time on activities that instructors do before they ever enter the classroom: teaching preparation. Using technology might cut the current preparation time from 10 hours per week to 5-6 hours. Curricula and other processes linked to their production might be automated, saving up to 50% of teaching time. Modern technology can help improve preparations by generating better courses and methods. Specifically, numerous software programs let teachers assess students' knowledge of specific subjects and construct lesson plans appropriately. They may also obtain quality teaching resources utilized by peers all across the world, as well as split students into groups and customise programmes for each. Also, technology can help with the review process. There has been software that can evaluate extensive replies and bring out to teachers certain oddities in student knowledge and development for a long time.

Technology saves the least time when teachers and students are directly interacting. However, adopting innovative forms of instructional material, and technology may improve the learning and teaching process. Meaning instructors are encouraged to utilise educational software in their classrooms and to use it to improve their teaching skills. This will alter teachers' roles to some extent, making them more facilitators and coaches. Teachers may utilise the saved time to construct individualised learning and



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individual mentoring strategies for their students. Most teachers aim to cater to their students' individual needs. However, time is the biggest problem for 69% of them, while lack of technology in the classroom is cited by 22%. Thus, technology can save time by automating paperwork and other bureaucratic tasks, but it can also provide new tools for better and more advanced individualised learning. We might have more effective instructors and hence more successful students who are technologically savvy (Kuleto et al, 2021).

Finally, automation will free up time for instructors to collaborate, develop diverse teaching techniques, and further their own professional growth. Together, they can provide more engaging and efficient courses for their students. In schools where instructors collaborate and support one another, up to 80% of teachers report improvements in student learning and engagement. The research by McKinsey clearly shows how technology may improve current educational methods. Some futuristic technology is required to save time, tailor instruction, and create successful students. These activities can be accomplished successfully using today's educational and technical means. To achieve this successfully, the government, school officials, technological businesses, and most importantly, teachers and students must all work together.

Method

The study is based on an anonymous survey distributed to K-12 LINK Educational Alliances (LEA) to evaluate the level of knowledge held by LEA teachers regarding AI, the evaluation of AI utility within the teaching process, and the teachers' opinion regarding AI implantation in the educational process. Primary and secondary research is the research approaches used as well as Content examination, As a test method methodology, a survey is used, and an online questionnaire is used to gather data. We used observation (with participation), Induction and deduction, and Statistical techniques (descriptive statistics). SmartPLS Software version 3.0, was used to analyse the quantitative data collected.

Secondary research on the use of artificial intelligence in education has been extensive. Several case studies were examined to generate a questionnaire and research questions that will lead us throughout the investigation. A questionnaire for online research designed specifically for this study was mailed to the addresses of 152 instructors engaged in five LINK Educational Alliance levels of elementary and secondary education (K-12).

The population is also visible in accordance with the research's stated purpose. As it is required to define the population of its qualities and size in any research that involves respondents, it is necessary to define the population of its characteristics and size. The study's participants are LINK Edu Alliance elementary and secondary school teachers. The population is represented by the total number of instructors at various educational institutions, which is 152 in the school year 2021/22. This is required so that we can determine if the sample we obtain is representative and sufficient. Because the population is small, even a small sample would provide us with a sufficient confidence interval with the level of 95 percent that is commonly



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employed in social research, but the research began with the goal of obtaining as large a sample as possible. as well as the support of both the principal and the administration of the schools included in the research. Our sample contains 77 respondents which give 50.66% of the overall population.

This study aims to provide an adequate model for testing AI attitudes in K-12 level of education in the Republic of Serbia, among teachers in elementary and secondary schools. That is why this study is a prototype study for a future research study on a larger population - the country size.

In stage II of our investigation, we examine the prospects that artificial intelligence in education presents in the eyes of LEA K-12 teachers. To solve this topic, we created a Structured Equation Model (SEM) using Smart PLS software.

Results

Results showed that K-12 teachers of the observed educational alliance have genuine knowledge about AI. The most significant percentage of respondents know what AI is, 45.45% of them, while the next category includes those who have a limited understanding of AI, 34.06%, those who know a lot about AI, 12.99 of them, those who claim to be AI experts. 2.60% gives 61.04% of those with different knowledge levels AI. On the other hand, 35.06% of those who claim to have a limited understanding of AI indicate room for educating LEA teachers about AI and its application in education. Respondents were asked to state whether the claim was true, false, or unknown about the basic definitions of artificial intelligence (Oxford). The most significant number of respondents noted that the statement is true in a large percentage of 83.12%, recognising the definition of artificial intelligence, which proves the basic knowledge and recognition of the meaning of artificial intelligence and its elements.

The most significant respondents believe that AI brings challenges and new opportunities to educational institutions, 67.53%. The most crucial percentage of respondents generally agree with the following AI opportunities in the education sector: AI can improve personalised learning. AI can develop skills in students. AI can provide an environment for shared learning in education. AI can help maintain a lifelong connection with alumni members (former students). AI has a lot of potential in improving the security of the institution. AI has a lot of potential in improving the efficiency of the institution. AI provides teachers with a calm, flexible, and accessible IT environment, allowing them to focus on research without any restrictions. AI provides teachers with an accessible research environment. I agree that AI will enable you to share and store large amounts of data. The largest group of respondents generally agree with the following AI challenges in the education sector: Integrating cognitive projects with system and privacy issues is a significant challenge for AI. The cost of technology is a big challenge for AI. Digital illiteracy is a big challenge for AI. The lack of AI technology experts is a significant challenge for AI. The lack of an



appropriate implementation strategy is a considerable challenge for AI. Until they know or are not determined to challenge: The rough nature of technology is a big challenge for AI.

In step II of our analysis, we evaluate the opportunities in the opinion of LEA K-12 teachers and make the application of artificial intelligence in education brings. To answer this question, we used Smart PLs software to create a Structured Equation Model (SEM), as might be seen in Fig 1.

Our analysis works with two reflective variables: AIOpportunity, with eight subitems, and Aiutility, with 11 subitems presented in table 1.

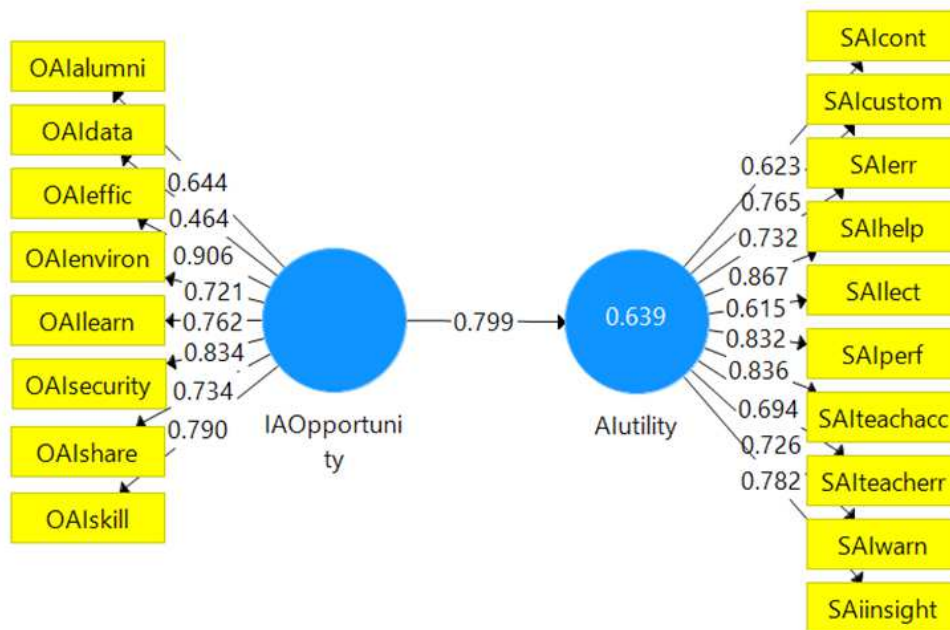


Figure 1. The Opportunities brought by AI transformed AI utility in the educational process

From figure 1, we may observe that loading factors for all subitems of our two variables, AIOpportunity and Alutility are more significant than 0.6. meaning that all the variables analysed and our survey question are representative and well-chosen. An exception is OAldata (0.464). LEA teachers do not consider a real opportunity that AI allows them to share and store large amounts of data, probably because they do not face this problem. The high Path Coefficient (0.799) reveals that LEA teachers consider that opportunities brought by AI will be transformed into specific utilities of AI implementation in the educational process.

Figure 2 reveals very high values for our principal variables AIOpportunity (0.906) and Alility (0.928) regarding Cronbach Alpha, meaning that variables represent the model. The rho_A value is more excellent



than 0.5, Composite reliability greater than 0.7 and AVE greater than 0.5, showing a very consistent and reliable model (Hair, 2022). This affirmation is proved by high values of R-square and Fsquare value (Figure 2)

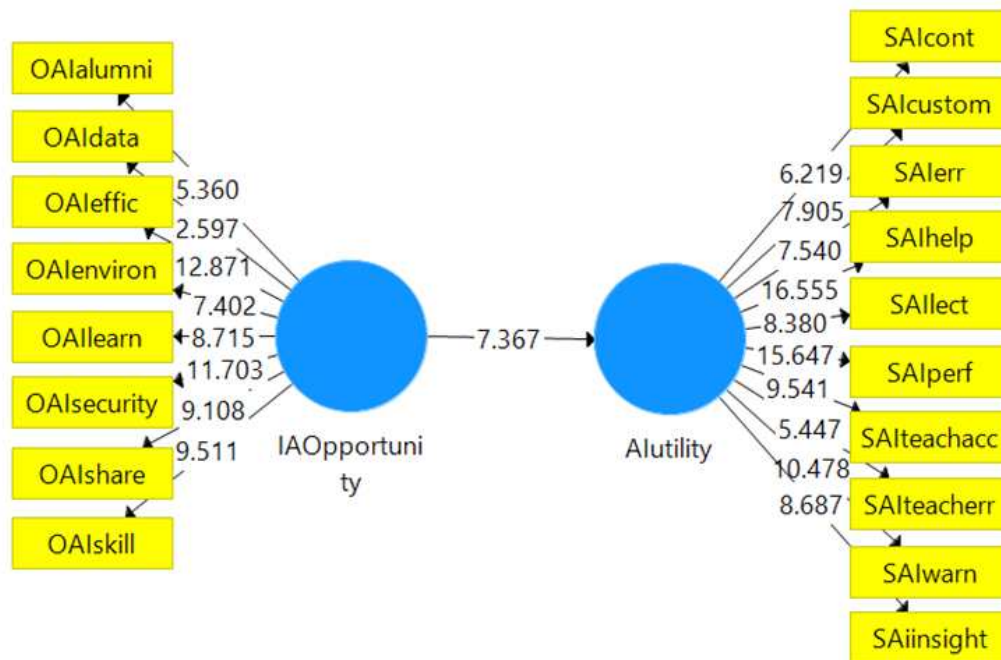
	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted...
Alutility	0.928	0.933	0.928	0.565
IAOpportunity	0.906	0.918	0.905	0.551

	R Square	R Square Adjusted
Alutility	0.639	0.634

Matrix		f Square	
	Alutility	IAOpportunity	
Alutility			
IAOpportunity		1.767	

Figure 2. Model reliability

Figure 3 prove no multicollinearity analysis between analysis, which strengthen our model. On the other hand, bootstrapping analysis shows a minimal deviation, a high T statistic, and p values less than the 0.5 limits, empowering us to affirm that our model is a very representative statistic.



	Original Sample ...	Sample Mean ...	Standard Deviation ...	T Statistics...	P Values
IAOpport...	0.799	0.814	0.108	7.367	0.000

Figure 3. Bootstrapping and multicollinearity analysis

Discussion:

The results showed that the educational alliance's K-12 teachers genuinely understood AI intelligence. Our analysis also proved that LEA teachers consider opportunities:

- AI can develop students' skills.
- AI can provide an environment for shared learning in education.
- AI can help maintain a lifelong connection with alumni members (former students).
- AI has a lot of potential in improving the institution's security.
- AI has a lot of potential in improving the efficiency of an institution.
- AI provides teachers with a calm, flexible, and accessible IT environment, allowing them to focus on research without any restrictions.
- AI provides teachers with an accessible research environment.
- AI allows you to share and store large amounts of data.
- They also consider that these opportunities might be translated into AI utilities, such as:
- AI can increase student performance progress.



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- AI can help keep students in the learning process (by identifying students at risk).
- AI will provide an early warning system for students' risky behaviours.
- AI can improve student performance and engagement.
- AI will enable the personalisation of the learning process by identifying the best way to teach materials (audio, video, e-book), which will significantly contribute to the quality of teaching.
- AI can enable the teacher to better insight into student performance.
- AI can analyse students' incorrect answers and suggest which teaching units require additional learning.
- AI could help me search for materials and content for my lectures more easily.
- AI could help me save time when planning the content of my lectures.
- AI can help me make fewer mistakes.
- AI can help me be more successful in my work.

The results demonstrated that the observed educational alliance's K-12 teachers understand AI. The most significant number of respondents know what AI is, 45.45%, followed by those who know little about AI, 34.06 percent, and those who know a lot about AI, 12.99 percent. 2.60 percent gives 61.04 percent of people who know AI. However, 35.06 percent of individuals with insufficient knowledge of AI believe that educators should be educated on the topic. The respondents were asked whether the basic definitions of artificial intelligence were true, false, or unknown (Oxford). The majority of respondents (83.12 percent) agreed that the statement is accurate, proving fundamental knowledge and recognition of the meaning and elements of artificial intelligence.

67.53 percent of respondents feel AI presents difficulties and new chances for educational institutions. Most respondents agree with the following AI opportunities in education: AI can help personalise education. AI can help students learn. AI can facilitate collaborative learning in education. AI can help alumni stay connected for life (former students). AI has a lot of promise to improve institution security. AI has a lot of commitment to enhancing institution efficiency. AI allows professors to focus on research in a quiet, adaptable, and accessible IT environment. AI makes research accessible to teachers. I concur: AI enables large-scale data sharing and storage. Most respondents agree that the following AI issues in education: Integrating cognitive projects with system and privacy considerations is a difficult task. Technology cost is a crucial issue for AI. Digital illiteracy is a major AI issue. The shortage of AI technology professionals is a significant issue. The lack of a proper implementation plan is a significant issue for AI. To know or not to know: Intuitive technology is a considerable hurdle for AI.

Conclusion

Learning to be effective later in life must rest on a solid foundation acquired early in life. Front-loaded educational biographies need to evolve into more complex and diversified learning trajectories throughout



life,,, with learning integrated into work and other contexts. Machine learning, artificial intelligence, qualifications and credentials are essential features of modern education systems. These institutions were adequate gatekeepers of successful educational paths, labour market entry points, and professional entry points in the industrial age. They also served as indicators of educational attainment, markers of social mobility and providers of guaranteed, lifetime access to specific economic privileges and social status. It will be irrelevant in the future knowledge economies when digitalisation and AI drive constant professional mobility and shifting skill requirements. Partial-time and dual-learning experiences and novel kinds of evaluation and certification (micro-credentials, nano-degrees, digital badges, etc.) contribute to the fragmentation of normal educational pathways.

Teachers must be adequately taught in the use of current technology and provide feedback as users of these tools. This is the fastest and most tangible approach to extend and re-establish established technical solutions, and to reject and replace inefficient ones with more efficient ones. Finally, while developing educational and technical products and software solutions, technology businesses should listen more to teachers.

If we approach the use of current technology in education with this proactive attitude, AI will be a great motivator, not a danger. In just ten years, we might greatly enhance education by introducing artificial intelligence into instructional procedures, giving instructors more time for themselves and their students.

LINK Educational Alliance (LEA) is an educational alliance located in Serbia that includes privately-owned formal and informal education providers, educational technology services, and business support. To learn more about teachers' perceptions of AI-based solutions, the opportunities and challenges that AI would bring into their daily activities, and their genuine knowledge about AI, exploratory research was conducted among 152 K-12 teachers. We utilised SmartPLs 3.0 to perform inferential and variable association studies. The teaching process is based on K-12 teachers' perceptions of activities that could be automated by AI in the educational process and their level of awareness and understanding of AI. For example, AI can automate specific processes and tasks, allowing teachers to work more efficiently and spend more time "directly connecting with students," as the core premise is tested.

The limitations of the research lie in its exploratory nature and small sample, but keeping in mind that this is a pilot study for a country population (K-12 teachers in Serbia) which is the future research goal, has its great potential and contribution.

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