Educators' Perception of Artificial Intelligence as Instructional Tool

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Abstract – **With artificial intelligence technologies disrupting status quo of many technologically advanced national economies, educators should face the challenge to harness their potentials without risks to learners. This exploratory mixed-method study aims to add to the growing volume of research that focuses on educators' attitude towards AI, their views on its applicability in education and necessity to develop AI competences. The research involved 132 in-service and pre-service educators who completed a questionnaire; nine of the participants also took part in follow-up interviews. The results revealed that the majority of educators perceive AI as a promising and useful tool, albeit sometimes complex, risky and not very smart. Most educators report low level of competence and infrequent usage of AI but readiness to undergo training. The research findings speak for the urgent need to design and implement professional development and teacher training courses that debunk myths about AI and build practical skills for applying AI affordances in all levels of education.**

Keywords – **Artificial intelligence, transformation of education, professional development, instructional technology, teacher attitudes**

1. Introduction

Artificial intelligence technologies have recently become key drivers for the development of many economically advanced communities. Seen as an integral part of the fourth industrial revolution, they can trigger the fourth revolution in education [1]. Technologies for processing and generating natural language, machine learning and deep learning have the potential to qualitatively transform instructional approach and education management systems, capitalizing on personalized teaching and learning models [2], [3], [4].

AI technologies have reached such a level of development that they have become not just an object of attention for individual innovators but a tool available for mass adoption and implementation. Statistics indicate a significant increase in interest in AI technologies in the last 2-3 years, and the growth is observed in a number of parameters – the number of scientific research, AI-based software development, jobs, Internet search queries, as well as the volume of investments [5]. Today, the global AI market is valued at more than 143 billion US dollars [6].

AI is seen today as a catalyst for the transformation of education, which affects all parties involved – students, teachers, parents, educational managers, and policymakers [7]. However, the integration of AI into the education system may be hindered by a number of challenges related to ethical issues, state regulations, quality of new instructional models and AI-based technologies, and AI literacy of educators [8], [9], [10], [11], [12]. Moreover, when it comes to the use of modern information and intellectual technologies with children, scholars and practitioners emphasize the need to consider questions related to the appropriateness and safety of technology usage as educational tools [11], [12], [13].

While these challenges require responses in multiple dimensions, it is the attitude and readiness of the teaching community what may significantly speed up or slow down the process of the conscious and effective implementation of smart technologies in classrooms.

The professional competencies and personal attitudes towards AI technologies of those who are called upon to design and implement new practices – the teachers – may directly affect the integration process [14], [15]. While educators working in STEM subjects might be more willing to adopt new technologies, those in the humanities might be less inclined to do so [16]. The purpose of this study is to examine the perception and usage of AI technologies among in-service and pre-service educators working or preparing to work in the humanities (language education) and early childhood education and explore their readiness to develop AI competences.

2. Literature Review

Artificial intelligence technologies have been the focus of scientific research for at least the last 20 years. Notably, large-scale research and investment in AI has chiefly focused on the technological side of the issue; research of AI application in social sciences and the humanities have mostly been on the periphery. However, provoked by recent developments in AI technologies and introduction of generative AI, in the last 3-4 years there is a sharp interest in this subject in educational research.

Fundamentally, there are two areas of application of AI in education (AIED): AI to support teacher's work (teacher-focused AIED) and AI for educational administration (system-focused AIED) [17]. AI-based applications have been shown to help increase learning motivation, ensure better memorization and mastery of content material, provide high-quality and unbiased assessment [17], [18], [19]. Moreover, e-learning systems, including intelligent tutoring systems (ITS), generate big data, which can be subjected to analysis and become an evidence base for making decisions related to instructional activities and educational policies [20]. ITS are capable of building individual learning trajectories by monitoring students' progress and adapting to their individual needs [21], [22], [23].

Meta-analysis of 100 scientific publications for 2010-2020 on the use of AI in education shows that the global scientific community is interested in three main aspects: 1) the development of AI technologies as a means for creating smart learning environment, 2) the use of previously developed AI techniques to provide students with feedback, reasoning, and adaptive learning, and 3) application of AI technologies that considers questions related to human affection (affective computing), gamification, immersive learning, and role-playing [1].

Research over the last decade indicates a significant increase in the interest of developers in creating intelligent tutoring systems and constructing AI-enhanced classrooms for different categories of students and for a range of disciplines.

Until recently, such developments mostly targeted university students majoring in computer science or related fields [4], [24], [25]. These days research studies have started demonstrating potential of AI technologies in secondary and primary schools [26], [27], [28] and even in preschool settings [29], [30]. Educators also find ways to apply AI when teaching children and adults with disabilities, such as the blind [31].

Many school and preschool curricular have mostly focused on developing basic AI skills and promoting a positive attitude towards new intellectual technologies [29], [30], [32]. However, technological breakthroughs in the last few years and widespread access to neural networks have shown potential for using AI in teaching other disciplines, including mathematics and natural sciences [33], [34], humanities [35], [36], [37] and even physical education [38]. Among early users of generative AI are language teachers and linguists who explore its affordances for developing communicative competencies with different categories of learners – university [39], [40], [41], secondary [42] and primary school students [43], [44] – and construct AI enhanced learning environments for developing listening [43], [45], writing [46], [47] or speaking [48], [49] skills.

Studies, however, have also raised concerns related to the introduction of AI in education. Researchers discuss challenges related to ethics, equity, and accessibility [50], [51], [52]. Arguably, AI systems are based on data that reflect subjectivity and bias of their creators, which translates into gender, racial, cultural, and other forms of biases [50], [52]. According to Akgün and Greenhow [50], face recognition and recommender systems embedded in ITS compromise students' privacy, automated scoring systems perpetuate social discrimination, predictive systems jeopardize students' autonomy and agency, while personalized learning systems raise concerns with surveillance. Holmes [52] also argues that "AIED's emphasis on standardized testing and measurable outcomes overlooks individual student needs and stifles teacher creativity", while "commercialization could also degrade the role of teachers, reducing them to service providers…" (p. III-IV).

Moreover, as with other types of instructional technologies, benefits of AI-enhanced learning and teaching might not be assessed without considering the quality of AI systems and teacher's skills to apply them in a specific educational context [52], [53], [54].

Thus, literature suggests that integration of AI technologies in education might be both beneficial and risky. As such, one may expect that those who are on the front line of their application – the educators – may have a range of views and attitudes towards the innovative technologies.

Educators' predisposition may affect their willingness and readiness to integrate AI into the classroom [55], [56]. While teacher training in AI have just started being introduced in some technologically advanced countries, a few recent studies show that knowledge about and experience with AI-based tools help better understand AI value as an instructional tool and contribute to educators' willingness to apply them in practice [56], [57], [58]. Moreover, those educators whose subject matter have little to do with the STEM disciplines, specifically those working in the humanities, are generally in disadvantage when it comes to working with technology [16]. This study aims to add to the growing volume of research that focuses on educators' attitude towards AI, their views on its applicability in education and necessity to develop AI competences. Examination of educators' attitudes towards AI tools, their digital competencies, and intentions to use AI may have valuable implications for designing quality teacher training and professional development programs [58].

3. Materials and Methods

This exploratory mixed-method study involved two major instruments of data collection: a questionnaire and follow-up interviews. The questionnaire consisted of 22 questions, including 15 multiple-choice questions and 7 open-ended questions. The first 6 questions were designed to collect demographic data (participants' educational background, age, gender, teaching experience and field of work or study). The main body questions were divided into three thematic blocks: 1) understanding of AI technologies; 2) the level of competence in AI technologies; 3) integration of AI technologies in education. The questions were based on extensive literature review and aimed to answer the following research questions:

1) How do in-service educators and future teachers (post-graduate students) working or preparing to work in the humanities perceive artificial intelligence (AI)?

2) How do study participants assess their level of competence in digital technologies in general and AI technologies in particular? How and why do study participants choose to use (or not to use) AI technologies in their personal and/or professional lives?

3) Do educators see the need to learn AI technologies and integrate them into the classroom?

The overall goal of the study was to examine the current status quo in the use of AI technologies by educators working or preparing to work in the humanities and to outline further steps needed to be done by researchers and practitioners to ensure efficient and effective integration of AI in classrooms.

To recruit the participants, a link to an anonymous online questionnaire designed in Google Forms [https://forms.gle/YVH4rQubexX8YfHS8] was sent to instructors and post-graduate students of the humanities majors (linguistics, literature, and language education) at one of the large research-based universities in Russia, as well as to 4 early childhood education centers. A printed version of the questionnaire was also distributed among the participants of one of the international conferences for language and early childhood educators hosted by the same university. A total of 132 respondents completed the survey in October-December 2023. The questionnaires revealed that the survey participants were university professors of humanities (13%), schools teachers (15%) and pre-school and kindergarten educators (72%). Most respondents were 31-40 and 41-50 years old (35% and 32% respectively), followed by respondents aged from 20 to 30 (23%) and from 51 to 60 (7%); there were also respondents aged 61-70 (2%) and over 70 years old (1%). Ninety-three percent of the respondents were women. About half of the respondents reported having a bachelor's degree (45%), 25% had a master's degree, 22% defended their PhD dissertations, and 8% were undergoing postgraduate studies. After the survey, those who chose to provide their emails at the end of the questionnaire (N=23), were invited for follow-up interviews. Nine of those contacted agreed and underwent an interview via web-conferencing software; each interview lasted from 16 to 29 minutes. Among interviewees there were two males (a post-graduate student and a university instructor, both from 31-40 year-old age range) and seven females (a post graduate student and university instructors ranging from 20 to 50 years old).

The data analysis involved quantitative and qualitative methods of data processing. Answers to closed-ended questions were counted for frequencies, while open-ended survey answers and recorded interviews were theme-coded.

The interviews aimed at gathering in-depth commentaries on the questionnaire answers and record participants' lived experiences and perceptions [59]. The survey and interview data were cross-checked by two researchers to verify codes and ensure consistency. The answers provided by nine interviewees were compared and contrasted to explore larger themes that emerged from all the data.

While the research design involved a medium-size sample of participants (N=132) and collected data from two sources – the questionnaire and follow-up interviews, the study results are limited in transferability. The participants were all self-selected and presented the views of a group of in-service and pre-service educators limited geographically, by their affiliation and by their disciplines (only those in language education and early childhood education).

As such, the results could not be generalized to the whole population. On the other hand, to contribute to verification and validation of qualitative analysis, the study was designed in accordance with M.Q.Patton's [60] recommendations and involved *methods triangualation* (use of both quantitative and qualitative methods of data collection), *triangualation of sources* (the questionnaire and interviews), and *analyst triangulation* (use of two analyst to conduct analysis and review findings). Still, the study findings might have been limited due to the two researchers' perspective on AI technologies as potentially useful instructional tool. This perspective was levelled by triangulation methods mentioned above and by close examination of negative views on AI technologies in education.

4. Results

Close examination of quantitative and qualitative data yielded results that were grouped according to three research questions (RQs).

RQ1: How do in-service educators' and future teachers' (post-graduate students') perceive artificial intelligence?

In the first block of the questionnaire, study respondents were asked to provide their own understanding of the concept of artificial intelligence. By this concept, the majority of respondents understand a certain "program" or "technology" capable of performing cognitive (creative or, conversely, routine) tasks (30%). Artificial intelligence also refers to something that can generate text or images based on large databases (19%). Some respondents (15%) understand artificial intelligence as a certain "smart" object, for example, a robot, device, or assistant, while the same number of respondents perceive AI as the "mind" or "brain" itself, created by man.

One respondent also defined AI as *"a window through which one can look into the future."*

The study participants selected the following most well-known AI technologies (from most to least popular): 1) AI-based chatbots (in particular, ChatGPT); 2) voice assistants based on AI (such as Alice, Siri, Alexa, Marusya and Salyut); 3) neural networks as an implementation of AI (image generators, e.g. Midjourney, DALL·E, Craiyon, and song generators, e.g. Suno AI); 4) robots (autonomous vehicles, smart household appliances and systems). More than 25% of the respondents claimed that they do not know any AI technology.

When asked which of the proposed words respondents associated with AI, the majority of respondents selected "promising" (68%) and "useful" (52%).

They see AI mostly as a "helper" (60%), less often as a "threat" (19%) and a "replacement for a person" (21%). Respondents consider AI "attractive" (28%), but at the same time "complicated" (29%), "confusing" (8%) and "incomprehensible" (6%). Moreover, the following associated words and phrases were voiced once: "devoid of human individuality, emotionless," and "costly, soulless and encouraging laziness."

When explaining her choice of AI-associated words, one of the interview participants argued that AI is not as intelligent as one may expect because it lacks creativity and may provide unhelpful suggestions, which shows deficiencies of current AI-technologies. However, in three other follow-up interviews, the association of AI with an aid was explained by its ability to help with creating instructional materials and texts (including a term paper or a letter of motivation).

The negative associations were voiced mostly by those with low or none experience with AI. One of the interview participants justified her association of AI with a threat by drawing parallels with addictive nature of screen technologies that lead to speech deficiencies in children. Another interviewee explained his association of AI with a threat by its unpredictable impact on children due to the replacement of face-to-face communication to interaction with technology. According to this participant, the "soulless" AI can "create the illusion of human presence" and lead to mental disorders. Interestingly, the three interviewees with mostly negative attitude to technology expressed their doomster's belief in the "raise of the machines" demonstrated in some films and literature. Still, the study revealed that only 4% of the respondents had a negative attitude to AI technologies.

Thus, the study results suggest that in general AI is perceived positively, although sometimes warily.

Many educators are confused about what AI is; however, they see the significant potential of intelligent systems, while some have reservations about their usage in education.

RQ2: How do study participants assess their level of competence in digital technologies in general and AI technologies in particular? How and why do study participants choose to use (or not use) AI technologies in their personal and/or professional lives?

The second block of questions in the questionnaire focused on AI literacy and AI usage in personal and professional lives. A third of the respondents believe that their level of competence in AI technologies is below average (19%) or low (14%): none of the survey participants found their level to be very high.

However, the level of competence in digital technologies – on the contrary – was defined as high by almost a quarter (21%) (Figure 1).
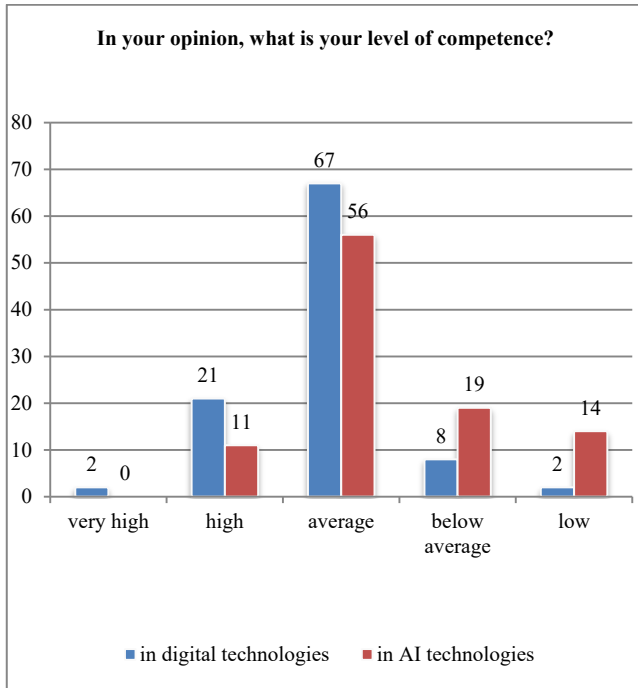

Figure 1. Self-assessment of literacy in digital technology in general and in AI technologies (%)

Analysis of the responses suggests a link between competence in the field of AI and the age of the respondent. As shown in Figure 2, only respondents aged 21 to 40 declare a high level of competence (16%); another 38% consider their level to be average, and 15% rate it as low.

The majority of respondents from 41 to 60 years old assess their level of competence as either below average (42%) or low (25%), and only 31% consider it average. Among the five people aged 61 years and older not one rated her/his level of AI competence as higher than low. This confirms previous research that innovations, including new digital technologies, are better adopted by the young [61].
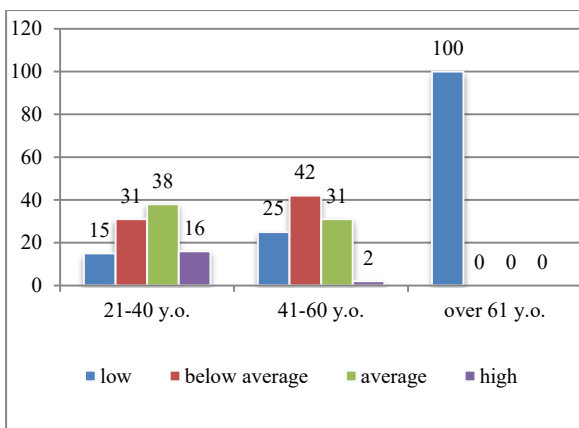

Figure 2. The level of competence in the field of AI by age categories

While the survey results showed the connection between digital competences and age, follow-up interviews also confirmed that educators' disbelief in AI technologies may come from their personal negative experience with digital technologies and lack of training. In one case a young university instructor with no training in AI referred to her 3 year-old daughter whose speech abilities are much higher than her peers' due to (as the mother claims) very limited exposure to any screen technologies. At the same time, a mother of two 20-month-old twins showed very positive attitude to AI technologies and revealed her high usage of AI for professional purposes (though not with her toddlers) thanks to training she had previously had.

Some experience using AI technologies for personal purposes was declared by 47% of the respondents. However, the figure dropped sharply to 37% when educators revealed their AI application in professional life, more than half of the respondents (52%) do not have any experience in using AI technologies in their professional activities (Figure 3).
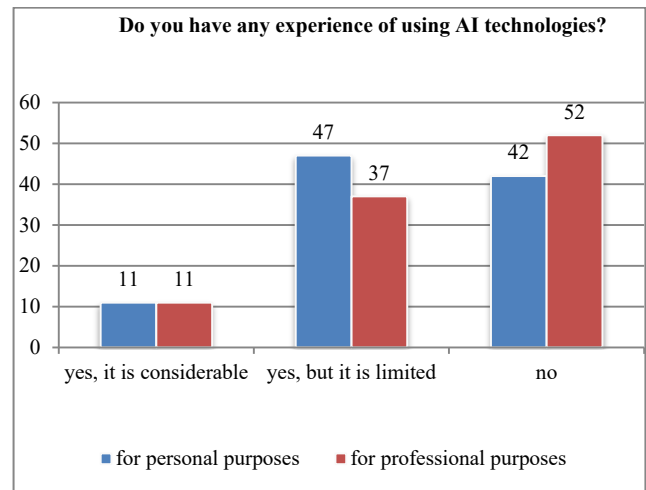

Figure 3. Usage of AI technologies for personal and professional purposes (%)

Interestingly, follow-up interviews revealed that some participants may underestimate their technology competencies and usage of AI; two educators confessed using ChatGPT, while not showing it in their survey answers. Moreover, three out of nine interviewees said that they took professional development courses which helped them better understand AI and its affordances in education context.

The answers to the survey question and interviews indicate that in the vast majority of cases existing experience in the use of AI comes down to processing and creating photo and video materials through neural networks. Respondents also use AI technologies to write or correct text (articles, posts, projects, etc.).

Most often educators use AI technologies in the preparation and actual conduct of classes and instructional activities:

I use Twee to create assignments.

I use artificial intelligence chats with children when preparing for exams.

I use chatGPT for assignments for students: for example, discussion questions, find the definition of a word, etc.

I was looking for ideas for developing teaching materials in a foreign language. I drew inspiration [from AI] to create scenarios for instructional events.

The study also revealed that some students can use AI technologies when preparing research papers and projects, in particular *"to complete the final work while studying at [name of a university]"*, to write essays and articles or for paraphrasing.

University employees may resort to AI technologies when conducting research studies in order to collect, systematize, and analyze data. One respondent declared using GPT chat *"to collect digital traces for a scientific project."* In their interviews, three university instructors also confessed of using AI technologies for creating tests for students and one for editing her speeches written in a non-native language.

Three kindergarten educators pointed to their AI-enhanced LEGO experience when children *"created a robot to help mother, and asked it to do a specific task. The robot performed brilliantly."*

RQ3: Do educators see the need to learn AI technologies and integrate them into the classroom?

The majority of the study participants agree that AI technologies should be integrated into education and there are a number of reasons for this. Firstly, 24% of the respondents pointed to many affordances that make AI technologies a helpful instructional aid:

AI contributes to a more objective assessment of the effectiveness of training, taking into account criteria, and indicators. AI offers a deeper and more comprehensive analysis of the tasks under study, identifies signs of typical problems, etc.

If used skillfully, [AI] could also be programmed to: check homework, drawing up a class schedule (to evenly distribute the workload for each teacher without wasting time), designing a training program, search for [plagiarism] in students' diplomas..., automation of processes aimed at collecting data and entering into tables, and much more...

Moreover, a third of study participants associated AI technologies with future. They suggested that if educators want to *"keep up with the times"* and to bring a considerable benefit to both themselves and learners, they need to adopt artificial intelligence technologies:

I believe that it is necessary to use AI in education, as the world, people, our routine, and employer requirements are changing. Education must adapt to the development of society.

AI is becoming part of everyday life, and students' ability to use technology will be an important skill of the future.

I am in favor of using AI technologies as they create a strong foundation for [children's] future academic success.

On the other hand, a quarter of the respondents – while having a generally positive attitude towards the use of AI in education – are still somewhat cautious and suggest that AI should be limited by some boundaries. The respondents note that AI can only be an assistant in the process of teaching and raising children of any age, but it cannot replace a person. In addition, AI can be effective, but it must be used in a "limited/moderate" amount. They argue that AI can only be useful if "the teacher knows exactly how to use it." Among five participants who expressed their overall negative attitude to AI, one noted that AI is "risky, so strict control of AI by people is needed".

Despite the concerns and doubts expressed, the vast majority of the respondents support the statement that a modern educator needs to master AI technologies in order to use them successfully in education. Among participants, 19% completely agree with this statement, 63% agree, 9% do not see the need to use AI in their professional activities, and 9% are undecided on this issue. Similarly, the majority of study participants (76%) completely agree or agree that teacher training and professional development courses should include modules that develop AI literacy among pre-service and in-service educators.

Nine interview participants were also invited to answer the question "What should be done to ensure the integration of AI technologies into the educational process?" Most commonly, the interviewees suggested that educators should be trained in AI and provided with methodologies of AI application in the classroom. In addition, educators should have (free) access to AI technologies and equipment to use them in classroom settings. One interviewee also argued for financial investments in AI related research and technology that would help meet challenges specific to education. Three of the respondents also mentioned the need for strict regulations and control by experts that would ensure safe usage of AI technology in education. One educator saw no need in any training as "this is not a priority".

5. Discussion

The research shows that most study participants are familiar with some AI technologies, although they do not often apply them in practice for personal or professional purposes. The majority of educators (91%) perceive artificial intelligence as something interesting, promising and useful, albeit complex and sometimes not very intelligent. While recently it was possible to learn about negative cases of using AI in the educational process [62], [63], most respondents have a positive attitude towards this technology and see the need to master it for professional purposes. At the same time, five respondents voiced their strong concern related to the perceived negative impact of AI technologies on students at the cognitive and socio-relational levels, specifically on speech development of young users. Moreover, the results of the study indicate most educators' low assessment of their competence in AI, which is especially typical for respondents over 40 years old and for those with close to none experience with AI technologies. Meanwhile, the majority of the educators who participated in the study see the promise of working with AI technologies, understand the importance of mastering them and are ready to undergo training in this area.

In general, despite the fact that this study was based on a relatively small sample of self-selected participants, its results confirm the conclusions of some previous studies, where a survey of teachers also showed fairly low competence in the field of AI, but an understanding of its high potential as an educational tool [64], [65], [66]. For instance, a survey of Estonian teachers demonstrated that in spite of their lack of knowledge about AI, they treat the gap as an opportunity for lifelong education [64].

Questions regarding the negative impact of the use of AI on the students' interaction with content, the teacher or peers have also previously been repeatedly voiced in articles by researchers [67], [68], [69], and they seem to be of not much difference from those concerns regarding computer (mobile, online, digital) technologies raised in educational research in the last 20 years.

The results of the study demonstrate the importance of teacher-training and professional development programs for in-service and pre-service educators. The findings suggest that such programs should be designed to address a few important matters. First of all, they should debunk myths about AI as a threat to humans and highlight its significant potential. Explaining exactly how AI makes decisions and how AI technologies work, can help the teacher create trust in AI and the desire to use its potential for the benefit of students [53], [70], [71].

Still, training programs should also provide space for discussing social, ethical and rights implications of AI [52], thus equipping educators with well-rounded knowledge about this phenomenon. Secondly, training programs should contribute to the development of practical skills in the use of intelligent systems [72] and should provide a clear picture of what is available on the market, while not forgetting about the need to assess for the pedagogical value of commercially designed AI-based platforms [52]. Finally, the programs should be tailored to the needs of educators, including their subject matter, curriculum objectives, existing access to technology, as well as their current digital competencies. Considering how fast technologies are being developed and updated, such training should be ongoing and provided on demand.

The study results go along with recent initiatives that call for the necessity of planned and regulated introduction of AI technologies in education across all levels of education – from early childhood to university. The development of AI literacy as a part of well-designed curriculum has become a priority issue for educators and policymakers in many countries.

For example, in Singapore, a number of state-supported projects and initiatives have been implemented in schools and universities to harness AI affordances that enable personalized learning and optimization of resources [3]. Korea has developed AI literacy curriculum for high schools [73] and introduced a teacher training system for these purposes [74]. The US school educators have developed and implemented interdisciplinary programs where knowledge in the field of machine learning and natural language processing is integrated into classes in geography, physics, and biology, while issues of ethics in the use of AI and its impact on society are studied along with technical issues [75]. The University of Florida has initiated an AI literacy training program for students of all majors [76]. A program and lessons for developing literacy in the field of AI for children aged 5-7 years was proposed by Hong Kong developers [77]. Taking into account the recent hype around generative AI, in 2023 UNESCO published its recommendations for the ethical and effective use of this new type of AI system [52]. Thus, integration of AI technologies in education has been considered on all levels – from institutional, to national, to global.

6. Conclusion

With artificial intelligence technologies disrupting status quo of many technologically advanced national economies, educators should face the challenge to harness its potential without risks to young and adult learners. Arguably, one of the primary tasks is to create curriculum and suggest effective methods and techniques for integrating AI into educational programs of all levels and forms: from preschool to higher education, from face-to-face to distance learning, from short-term to longitudinal courses. This study indicates that so far educators and researchers are in the early stage of accumulating the knowledge about how to create and implement safe educational environment built on AI technologies. The research findings speak for the urgent need to design and implement professional development and teacher training courses that debunk myths about AI and build practical skills for applying AI affordances in classrooms.

Today AI is seen as a phenomenon that has the potential to radically change the existing leading role of teachers and lead to organizational reforms. It is obvious that students and perhaps even preschoolers will not wait for permission to use new superpowers associated with the creation of texts and images comparable and often indistinguishable from human creations. They are already doing this.

That is why educators need to speed up and upgrade their AI literacy in order to use the undeniable potential of new technologies for the benefit of young and adult learners. Future research should demonstrate best practices and offer ways to adapt them to a range of educational contexts.

Acknowledgements

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