Bartın University Journal of Faculty of Education
BUEFAD Volume 13, Issue 2
232-244
dergipark.org.tr/buefad
DOI: 10.14686/1416087

Potential Benefits and Risks of Artificial Intelligence in Education

Mahmut Özer *

* Prof. Dr., Commission of National Education, Culture, Youth and Sports, TBMM, https://orcid.org/0000-0001-8722-8670 , *mahmutozer2002@yahoo.com

Research Article
Received: 7.1.2024
Revised: 7.3.2024
Accepted: 7.3.2024

Abstract

Artificial Intelligence (AI) technologies are rapidly advancing and causing deep-seated transformations in all aspects of life. In particular, the widespread adoption of generative AI systems like ChatGPT is taking this transformation to even more dramatic dimensions. In this context, the most comprehensive impact is observed in educational systems. Educational systems, on one hand, are faced with the urgent need to rapidly restructure education in response to skill changes in professions caused by the proliferation of such systems in the labor market. On the other hand, challenging questions arise about whether and to what extent these systems should be integrated into education, how they should be integrated if at all, and how ethical issues arising from AI systems can be addressed. This study evaluates the potential benefits and possible risks of using AI systems in educational systems from the perspectives of students, teachers, and education administrators. The systematic review considered the relevant studies on the potential benefits and risks of AI in diverse academic databases. Therefore, the study discusses the potential uses of AI systems in education, as well as the risks they may pose. Policy recommendations are developed to maximize the benefits of AI systems while mitigating the ethical and other issues they may cause. Additionally, the study emphasizes the importance of increasing AI literacy for all education stakeholders. It suggests that raising awareness of both the benefits and ethical issues caused by AI systems can contribute to enhancing the benefits of these systems in education while minimizing their potential harms.

Keywords: artificial intelligence, ChatGPT, ethics, education, AI literacy, education policy.

Eğitimde Yapay Zekâ Uygulamalarının Potansiyel Yararları ve Riskleri

Yapay zekâ (YZ) teknolojileri hızla gelişmekte ve yaşamın tüm alanlarında köklü dönüşümlere yol açmaktadır. Özellikle, ChatGPT gibi üretken YZ sistemlerinin yaygınlaşması bu dönüşümü çok daha dramatik boyutlara taşımaktadır. Bu bağlamda, en kapsamlı etki eğitim sistemlerinde gerçekleşmektedir. Eğitim sistemleri bir taraftan, bu tip sistemlerin işgücü piyasasında yaygınlaşması ile mesleklerde yaşanan beceri değişikliklerine hızla cevap üreterek eğitimi yeniden yapılandırma zorunluluğuyla karşı karşıyadır. Diğer taraftan, bu sistemlerin eğitime dâhil edilip edilmeyeceği, edilecekse nasıl ve ne derece dâhil edileceği, YZ sistemlerinin yol açacağı etik sorunlara nasıl cevap üretilebileceği gibi zorlayıcı sorularla yüzleşmektedir. Bu çalışmada bu kapsamda YZ sistemlerin eğitim sistemlerinde kullanılmasının potansiyel faydaları ve olası riskleri öğrenci, öğretmen ve eğitim yöneticileri açısından değerlendirilmektedir. Çalışma sistematik derleme deseninde tasarlanmıştır ve YZ'nin potansiyel yararları ve riskleri konusunda kapsamlı değerlendirme sunabilmek için farklı akademik veri tabanlarında yer alan çalışmalar dikkate alınmıştır. Bu nedenle bu çalışmada, YZ sistemlerinin eğitimde nasıl kullanılabileceği ve yol açabileceği riskler ele alınmaktadır. YZ sistemlerinin sağlayacağı faydayı maksimum yaparken yol açacağı etik ve diğer sorunların etkilerini hafifletmeye yönelik politika önerileri geliştirilmektedir. Ayrıca, tüm eğitim paydaşları açısından YZ okuryazarlığının artırılması, YZ sistemlerinin sağlayacağı faydaları kadar yol açacağı etik ve diğer sorunların da farkındalığına yol açacağı ve böylece bu sistemlerin eğitimde faydalarını artırırken zararlarının hafifletilmesinin mümkün olabileceği vurgulanmaktadır.

Anahtar kelimeler: yapay zekâ, ChatGPT, etik, eğitim, yapay zekâ okuryazarlığı, eğitim politikası.

To cite this article in APA Style:

Özer, M. (2024). Potential Benefits and Risks of Artificial Intelligence in Education. *Bartın University Journal of Faculty of Education, 13*(2), 232-244. https://doi.org/10.14686/buefad.1416087

INTRODUCTION

Artificial Intelligence (AI) technologies are widely used in various aspects of life. Particularly, the introduction of generative AI systems like ChatGPT has led to deep-seated changes in systems across all fields, causing significant transformations in labor markets and, consequently, in areas ranging from education to healthcare, economics to security (Acemoğlu & Restrepo, 2018; Frank et al., 2019; Perc, Ozer, & Hojnik, 2019). AI and data-driven smart systems, continually expanding as they complement each other, have resulted in people now living within an AI ecosystem composed of such socio-technical systems. The AI ecosystem has leveraged human-machine interaction to another level (Crawford & Calo, 2016; Harari, 2017; Süleyman, 2023). In fact, at this point, there is a discussion of a 'machine culture' generated or mediated by machines within AI ecosystems (Brinkmann et al., 2023).

At this point, discussions on the profound changes by AI systems in life, as well as the problems they have caused or may cause in the near future, are intensively debated (Süleyman, 2023). Data protection and privacy are at the forefront of these discussions, as the development of these systems by a limited number of institutions increases the control risks within the AI ecosystem (Boyd & Crawford, 2012). On the other hand, issues in the training data used during the learning process of AI systems reproduce existing biases in society and pose a risk of perpetuating inequalities (Aquino, 2023; Ulnicane & Aden, 2023). There is also a vigorous debate about the necessity for AI systems to consider ethical and moral values; otherwise, it may lead to other societal conflicts such as the perpetuation of biases (Rahwan, 2018; Stahl, 2023).

In short, it is emphasized that dramatic harms can occur in societies in all areas where AI systems are used, such as education, health, security, etc., when these systems do not take into account ethical and societal values. It is highlighted that from the design phase to the implementation phase, AI systems must consider ethical and moral values to align their behaviors with societal values (Rahwan, 2018; O'Neil, 2016; Piano, 2020; Stahl, 2023; Suleyman, 2023).

Education systems are directly and profoundly affected by this transformation. The first dimension of this impact is closely related to how education systems can rapidly respond to the radical and continuous changes in the skill sets demanded by the labor market (Acemoğlu & Restrepo, 2018; Frank et al., 2019). At this point, significant transformations are taking place in labor, with some professions disappearing, the required skill sets for continuing professions being updated, and even new occupations emerging in the labor market (Arntz et al., 2016; Aghion & Howitt, 1990; 1994; Bartelsman et al., 2004; Frank et al., 2019; Pajarinen et al., 2015).

Education systems, on one hand, are responding to the rapid and profound changes in the dynamics of the labor market, while on the other hand, they are facing a much different challenge of how these systems can be used in education, dealing with the ethical and other complications that their use may bring. AI systems, especially generative AI systems like ChatGPT, have the potential to significantly transform educational environments. This potential encompasses almost all areas, from changes in learning environments to the use of supplementary resources, from the student's learning processes to school management policies, and from measurement and evaluation approaches to the teacher's role in the classroom (Chen et al., 2022; Chiu, 2023; Grassini, 2023; Lo, 2023; Rudolph et al., 2023).

Therefore, in this study, we address the potential uses of AI systems in education and the risks they may pose. Additionally, we are developing policy recommendations aimed at maximizing the benefits of AI systems while mitigating the effects of ethical and other issues they may cause.

The advantages and risks of AI applications, which have a profound impact on education, will also provide important insights into these two dimensions. Furthermore, Farrokhnia et al. (2023) conducted a SWOT analysis of the effects of ChatGPT that provides important insights. According to the study findings, ChatGPT has strengths and benefits in that the answers it generates are extremely relevant to the information requested, that it is open to continuous development based on new information, that it differentiates the answers by taking previous answers into account when creating the answers, and that it can create answers associated with the inputs by taking into account complex inputs. A number of risks and threats are presented by GhatGPT in the same study, including that students are not able to gain a deep understanding due to the limited information provided by GhatGPT, that it reduces academic integrity, it reproduces content that may violate equal opportunity in education through the training data, as well as that it does not appear to be identical to any other information. It has been demonstrated that his constant quoting from sources has led to plagiarism accusations (Cotton, Cotton & Shipway, 2023), and that superficializing information limits the development of high-level cognitive skills. According to the same study, ChatGPT offers an array of educational opportunities, including the development of personalized

educational materials, the acceleration of information access, the provision of materials that can support complex learning, as well as reducing teacher workloads.

From a teacher's perspective, Humble and Mozelius (2019) conducted a SWOT analysis of artificial intelligence-based applications. According to this study, AI-supported applications are especially useful for meeting personal learning needs, are capable of transferring school education into the digital realm, and can serve as the basis for digital systems that provide students with rapid and personal feedback. As a result of this study, the weakness of the applications was demonstrated in the following way: the AI-based software that is used in education quickly compiles existing text and data and outputs it to the students with little innovation, and it is difficult to determine which biases and errors have contributed to the results obtained. According to this study, if teachers are not sufficiently knowledgeable about the structure and benefits of AI applications, they may direct their students too much toward these applications if they are not sufficiently informed. They are open to continuous development, so they may replace teachers who provide educational support, as well as reducing students' capacity to learn independently and conduct research. There has been some concern expressed regarding the possibility of reducing high-level and in-depth thinking skills.

A SWOT analysis of AI applications in higher education was conducted by Denecke, Glauser, and Reichenpfader (2023) from the perspectives of academics and students. The study found that the main advantages of AI applications are the ability to provide personalized learning opportunities, the ability to easily perform repetitive tasks, and the ability to provide students with interesting learning materials. In contrast, it has been argued that these applications may provide significant errors in terms of their results and feedback, as well as expanding the bias associated with the texts on which they are based. It has been noted, however, that the greatest threat to these applications is the need for teachers and academics to receive training in order to be able to use these applications effectively, that ethical principles must be included in this training, and that there may be violations of privacy rights and personal rights in the data sets that the applications use.

METHOD

This study is designed within the qualitative research perspective with a systematic review of the papers and reports on potential benefits and risks of AI in education. Systematic reviews allows authors to evaluate the previous data and research and contribute to the literature with recent developments for a more comprehensive perspective on any subject (Newman & Gough, 2020). Within this scope, the secondary data, findings and reviews on the AI and education are included as an extension to SWOT analyses of AI-based applications such as ChatGPT in an educational context. Major studies considering the relationship between AI with education in a critical context are considered. The study used document analysis to cover the topic, allowing researcher(s) to evaluate the elaborative scientific studies and current materials on related subject(s) (Morgan, 2021). In this manner, the potential benefits and risks of AI systems on students, teachers, and education administrators are identified. Subsequently, steps to increase these benefits and mitigate risks for students, teachers, and education administrators are outlined, along with the development of macro-level education policies.

SYSTEMATIC REVIEW

Potential Benefits

AI systems provide numerous alternatives to assist and support the responsibilities of students, teachers, and education administrators. One of the most significant potentials of AI systems is their ability to support learning in a personalized and adaptive manner (Zawacki-Richter et al., 2019). The active use of supportive mechanisms in education is possible at all stages within this context. Such systems can monitor the real-time learning process and emotional state of each student, supporting personalized adaptive learning (PAL) (Peng et al., 2019). Generative AI systems like ChatGPT have the potential to advance and enhance the PAL approach to a greater extent (Rudolph et al., 2023).

Teachers now have increased options for enhancing their educational environments with supplementary materials, starting from preparing lesson plans (Atlas, 2023). With this new situation, there is a radical change in teachers' workloads. While conventional workloads decrease, teachers are required to focus more on the personal development of individual students in the classroom. Moreover, they have the potential to create a much more innovative and interactive learning environment, moving away from conventional settings (Rudolph et al., 2023).

Teachers can actively use AI systems in preparing teaching materials, creating exams, conducting assessments, providing feedback to students, and developing interactive and innovative learning scenarios

(Grassini, 2023; Khan et al., 2023; Wang et al., 2023). Particularly, the assumption that each student is unique increases the possibility of individualized education in the classroom. Using intelligent tutoring systems (ITS), teachers can offer personalized education (Rudolph et al., 2023; Zawacki-Richter et al., 2019). Thus, the individual development of each student can be closely monitored, and resources tailored to their development can be provided. These resources are not limited to school settings; their accessibility outside of school environments can enhance the support of education in non-school settings (Grassini, 2023; Rudolph et al., 2023). On the other hand, there is an increasing opportunity for teachers to actively use AI systems in tasks ranging from assigning homework to generating questions. This allows teachers to spend the time they would allocate to preparing such materials on reviewing and improving the generated materials instead (Grassini, 2023; Sok & Heng, 2023).

The widespread use of AI systems is observed to transform classroom teaching activities, leading to much more interactive educational experiences (Sok & Heng, 2023). In fact, thanks to these systems, the flipped classroom approach, where education continues not only in the classroom but also remotely, is becoming more common (Rudolph et al., 2023). As a result, classroom time can be used much more efficiently (Lo, 2023). Specifically, the use of ChatGPT enables the generation and utilization of interactive scenarios that support students' collaborative problem-solving abilities (Rudolph et al., 2023). These systems, especially with ChatGPT usage, enhance students' potential for collaboration with peers, allowing for group discussions in projects and increasing opportunities for real-time feedback (Gilson et al., 2023; Kasneci et al., 2023; Lo, 2023). AI applications also facilitate the interaction between humans and machines, as well as between humans within a digital context (Seo et al., 2021). The AI enables more repetitive tasks to be completed easily, as well as providing more opportunities for creative and complex tasks (UNESCO, 2019). Furthermore, AI may also learn the level of students in a group and present diverse and individual options tailored to the needs of each individual and group (Bhutoria, 2022; Kamalov et al., 2023). In this context, radical changes are also occurring in the assessment and evaluation of students, despite the many shortcomings of AI systems in this area. AI systems offer different options for assessing and evaluating students' assignments and exams (Babitha & Sushma, 2022; Conijn et al., 2023). Additionally, teachers can use these systems to create open-ended questions and provide rapid feedback. Automated or semi-automated assessment systems can be established to provide feedback to enhance students' learning outcomes (Kasneci et al., 2023; Sok & Heng, 2023).

In schools, various systems commonly used for assessing essay writing, such as Automated Essay Scoring (AES), Automated Writing Evaluation (AWE), and Automated Written Corrective Feedback (AWCF), can now be integrated into a single system (Koltovskaia, 2020; Rodolph et al., 2023). Consequently, feedback mechanisms are strengthened, particularly to help students improve their writing skills after assessment (Garcia-Gorrostieta et al., 2018; Nazari et al., 2021; Rudolph et al., 2023; Zawacki-Richter et al., 2019).

One of the most significant potential applications of AI systems is the easy identification of a student's development and challenges (Grassini, 2023; Kasneci et al., 2023). This makes it easier for the teacher to contribute to overcoming these challenges for the student. In this stage, teachers can use these systems to create personalized support materials for the student, allowing for the active utilization of individualized support mechanisms for each student (Trojer et al., 2022).

Similarly, students are actively using AI systems in their educational journeys. The amount of assistance students receive from AI systems in preparing assignments and presentations is increasing day by day, and the use of these systems for such purposes is becoming more widespread. Especially with the language translation support of these systems, students not only access educational materials in their own country but also have the opportunity to access and translate materials from other countries in this context (Grassini, 2023). In other words, not only can resource limitations be overcome, but also the access to compensatory and development-supporting resources for the student's own shortcomings is increased. In fact, this opportunity is not limited to the population of school-age individuals; it can also address the lifelong education and development needs of adults. A similar potential exists for teachers in their professional development. These systems have the potential to continuously support the professional development of teachers (Chiu, 2023).

The increasing capabilities of Generative AI systems, particularly in Large Language Models (LLM), are influencing foreign language education (Grassini, 2023; Kasneci et al., 2023; Wang et al., 2023). As a result, both platforms supporting students in learning new languages and opportunities for teachers to enrich teaching materials for this purpose are on the rise. Specifically, while options like Grammarly and Wordtune are widely used for correcting English texts, ChatGPT enhances these options (Fitria, 2021; Koltovskaia, 2020; Rodolph et al., 2023). Similarly, the potential for AI systems to provide new perspectives in artistic fields such as poetry, music, and

painting is increasing, enriching education in these areas (Elgammal et al., 2017; Gangadharbatla, 2022; Köbis & Mossink, 2021; Rubinstein, 2020).

AI systems also have the potential to be used in educational management. With these systems, updating education policies both at the school level and systematically based on real data has become much easier (Chiu, 2023). These systems can assist students in selecting courses/activities based on their preferences, determine the likelihood of attending these courses/activities, and aid school administrations in decision-making and recommendations (Tsai et al., 2020; Villegas-Ch et al., 2020; Chiu, 2023).

A number of stakeholders within the field of education have stated that AI applications can be beneficial to the education process in a variety of ways. First and foremost, it has been repeatedly stressed that these applications have the potential to meet individual learning needs, as well as to develop support materials and respond to learning needs outside of the classroom (Bhutoria, 2022; Chen, Chen & Lin, 2020). AI applications have the greatest potential in this regard since they are capable of providing 'personal feedback,' which is one of the most important needs in schools. The use of artificial intelligence applications has opened up a new era, particularly in the field of assessment (Farazouli et al., 2023; Kamalov, Santandreu & Gurrib, 2023). By determining individual learning needs, assessment opportunities have been developed that better address these needs. Thus, systems are now available that are capable of automatically scoring written answers of students and producing results comparable to those of human raters (Mizumoto & Eguchi, 2023; Ramesh & Sanampudi, 2021). With the use of artificial intelligence, it is possible to create platforms which facilitate the work of education stakeholders in evaluating applications and cater to their personal requirements. The use of these technologies has also found great application in foreign language teaching, as recently demonstrated by LLM's support.

Potential Risks

In the previous section, while addressing the potential offered or soon to be offered by AI systems in improving the quality of education, in this section, the risks associated with this use are discussed. Privacy and data protection come at the forefront of these risks. It is critically important to safeguard the data generated for both students and teachers during the active use of AI systems in education. The compromise and misuse of this data for non-educational purposes pose greater risks (Kasneci et al., 2023; Tili et al., 2023). Especially, being captured and utilized by commercial recommendation algorithms carries the risk of restricting individuals' lifelong freedom.

One of the foremost risks is the inequalities in accessing AI systems. Disparities in digital literacy both between countries and within each country, and furthermore, inequalities in access to digital technologies, will result in only a segment of society benefiting from the advantages these systems offer (Cotton et al., 2023; Grassini, 2023). This risk is not limited to students but also applies to teachers (Rudolph et al., 2023). In particular, inadequate digital literacy among teachers or their lack of awareness or reluctance to use such technological capabilities will disadvantage educational environments compared to teachers who make use of these opportunities (Dignum, 2021). Thus, while the advantaged continuously increase their advantages with the contribution of these systems, disadvantages accumulate, leading to additional disadvantages and perpetuating inequalities. Considering that the most significant issue in educational systems is the increasing inequalities with the Matthew effect (Stanovich, 1986; Özer, 2023a; Özer, 2023b; Suna et al., 2020; 2021; Suna & Özer, 2022), the risk of these inequalities becoming insurmountable with generative AI systems is now a challenging problem (Chiu, 2023; Dignum, 2021).

Beyond general digital literacy inequalities, there are serious disparities related to AI literacy. While students rapidly address this deficiency due to the advantages it provides them, most teachers perceive this literacy as associated with technology teachers, and even in this context, school administrators are seen as the most disadvantaged group (Chiu, 2023). In such a situation, it will not be possible to consistently manage the transformations caused by AI systems in schools.

AI systems deeply impact the learning and education processes for both students and teachers. As mentioned above, these systems can provide very positive support mechanisms. The challenge lies in how and to what extent these systems are used. Transferring all the load on these systems, instead of being supportive aids is considered to have negative effects on students' development, skill acquisition, critical thinking, problem-solving skills, and research and thinking skills (Kasneci et al., 2023; Mhlanga, 2023; Shiri, 2023, Sok & Heng, 2023). On the other hand, it is warned that exams entirely prepared by these systems may not fully meet the learning objectives, potentially leading to deficiencies in learning outcomes (Al-Worafi et al., 2023).

For students, the riskiest situation is the potential consequences of not using these systems consciously and ethically in the education process. Having students complete all their assignments using these systems not only raises ethical issues but can also mask a lack of learning (Halaweh, 2023; Skavronskaya et al., 2023). Thus, students might jeopardize their learning and accelerate their corruption by developing behaviors that undermine respect for labor, such as plagiarism. Therefore, the number of platforms aimed at detecting such ethical issues has been continuously increasing in recent times (Naik et al., 2015). Despite often being insufficient due to the continuous development of AI systems, significant investments are being made in this field to strengthen the value of original work in the education sector (Basic et al., 2023; Grassini, 2023; Katz et al., 2023).

Another risk related to this is the inadequacy of the existing measurement and evaluation approaches used in education (Chiu, 2023). New approaches are needed to assess and evaluate efforts accurately and determine the contribution of these systems to student performance (Farrokhnia et al., 2023; Lo, 2023; Rudolph et al., 2023; Tili et al., 2023). Otherwise, there is a risk of rewarding students who use these systems unethically. Students who actively use AI systems for assignments or projects may receive higher grades than their peers who do not use these systems (Sok & Heng, 2023). Especially considering the inadequacies of existing programs used to identify students who complete their entire assignments with the help of these systems or to determine the similarity rates of generated texts, the situation becomes even more dramatic (Lo, 2023). Moreover, due to the risk of grading of unsuccessful students as successful with the support of these systems, their failures can be masked, depriving them of the opportunity to benefit from timely supportive feedback mechanisms to compensate for their deficiencies (Grassini, 2023; Lo, 2023).

Another risk, especially with the widespread adoption of generative AI systems like ChatGPT, is that the information generated for each lesson in education becomes more comprehensive and interdisciplinary (Miao & Ahn, 2023). In this new situation, it is no longer sufficient for teachers to be equipped only in their own fields; they are expected to be knowledgeable in the intersection areas of their fields with other disciplines and provide teaching with a much more interdisciplinary approach in the classroom (Chiu, 2023; Dignum, 2021). Otherwise, the teacher may be inadequate in dealing with this information in the classroom.

In this context, another risk is the proliferation of biases in the outputs generated by AI systems. As known, these systems learn from data influenced by societal relationships, and biases based on factors such as religion, gender, race, and culture in the data they use for learning can directly infect the system, thus embedded in their results. Therefore, it is not possible for every generated piece of information to be up-to-date, accurate, and reliable (Lo, 2023). For instance, an AI system trained on a dataset consisting of articles and works from a specific population can exhibit bias in evaluating the works produced by students outside of that population (Grassini, 2023; Mbakwe et al., 2023). On the other hand, numerous inaccuracies have been identified in bibliographic information produced by such systems (Lo, 2023; King, 2023; Mogali, 2023). If not corrected, there is a risk that these biases can be further exacerbated and institutionalized through the education system.

The active use of AI systems in education and the transfer of the workload to students through these systems, combined with teachers actively utilizing these systems, pose a risk of leading to new employment approaches by inaccurately assessing teacher efforts and reducing the need for teachers (De Cremer et al., 2021; Grassini, 2023; Howard, 2019). However, in the new situation, teachers are actually experiencing a shift not only in conventional workloads but also towards increased workloads as they adapt their focus to the new environment. This shift involves preparing innovative lesson plans and materials, with a particular emphasis on personalized education (Sok & Heng, 2023). In other words, teachers now have to spend a significant portion of their time enriching educational environments with new systems and focusing on reviewing students' work and providing feedback (Rudolph et al., 2023).

The strongest consensus in the literature regarding the risks associated with AI applications relates to concerns regarding data privacy violations (Huang, 2023; Marshall et al., 2022). Despite the fact that AI applications, specifically ChatGPT, were not developed to use verbatim texts, the fact that the algorithms produce results using these texts has led to many debates about the nature of the data used. This has led to ChatGPT being accused of 'democratizing plagiarism' by Welle (2023), and it was highlighted that the data underlying the algorithms are essentially intellectual property. It is also important to note that academic integrity is another risk that is frequently mentioned in this respect. Furthermore, if students use these technologies to answer exam questions, they may also become dependent on the competence of AI applications without clearly demonstrating their capabilities. Thus, commonly used applications, such as ChatGPT, have become capable of passing some exams successfully (Mehrabanian & Zariat, 2023), raising questions about the validity of these digital evaluations. The application standards are being updated to include stricter security measures for digital evaluations. AI

applications also present the risk of furthering the existing digital inequalities in society and falling further behind, especially in light of the fact that socioeconomically disadvantaged groups are not as likely to benefit from these technologies as their peers (Bulathwela et al., 2024). A technology such as artificial intelligence may serve as a tool to increase existing inequalities if disadvantaged groups are not supported and unable to make effective use of these technologies. Lastly, AI-based technologies may be able to reduce the need for teachers, and it was suggested that these technologies should not be considered an alternative to teachers.

DISCUSSION & CONCLUSION

AI systems deeply impact various aspects of life, bringing about radical transformations as their usage becomes more widespread. One of the areas with significant potential is education. Education systems not only face the challenge of rapidly responding to new skill demands in labor markets due to the proliferation of AI systems and automation but also grapple with the issue of how to ethically and effectively integrate AI systems into existing education systems. In this context, this study evaluates the potential benefits and risks of using AI systems in education.

At this point, instead of banning these types of systems in education and learning environments to prevent potential risks, the focus should be on how to integrate them into the system efficiently, promote equality, and, most importantly, do so in an ethical manner. The rapid and widespread use of ChatGPT, especially among students, shortly after its introduction, calls for urgent measures to enhance its effective use and alleviate potential risks. Those who use these systems will not only have advantages during their educational journey but also, when entering the workforce, will be much more advantageous compared to those who do not use these systems.

One of the most crucial stages in the integration of AI systems into the education system is the recognition of the assistive systems used by both students and teachers, as well as institutions. Therefore, educational systems must first reach a consensus with all stakeholders on how these systems can be beneficially used in education and what steps should be taken to prevent potential risks. Otherwise, efficient use of such systems and prevention of unethical usage will not be possible.

In the active use of AI systems in education, as well as in other fields, the 'responsible AI' approach, which considers ethical and moral values from the design stage to implementation, data protection, and privacy, should be adopted (Dignum, 2021). In this context, Stahl (2023) suggests re-evaluating the AI ecosystem, which consists of socio-technical systems and includes education, in the context of 'responsible AI.' He proposes placing all steps, from the transparency and accountability of the ecosystem to its alignment with ethical and moral values, under a framework of 'meta-responsibility in the ecosystem.' Therefore, just like in every application within the AI ecosystem, each AI system's processes, from design to implementation, data protection to privacy, should be conducted in a socially value-sensitive manner when used in education (Crawford & Calo, 2016).

In this context, perhaps the most crucial step to be taken is to increase the digital literacy and AI literacy of students, teachers, and education administrators. The importance of digital literacy, especially after the Covid-19 pandemic, and how it can deepen existing inequalities in education have been observed (Özer et al., 2020; Özer & Suna, 2020; Özer et al., 2022). Therefore, initiatives to enhance the digital literacy of students and teachers have the potential to reduce inequalities. Additionally, strengthening the IT infrastructure of schools will further enhance this potential. However, AI literacy in education is relatively new. Thus, there is a risk that inequalities in AI literacy may deepen educational inequalities with the use of AI systems in education. Therefore, comprehensive steps to increase AI literacy should be taken by all stakeholders in education. This way, awareness of how AI systems can be beneficial in education, the problems they can cause, and the ethical framework of their use will increase among all stakeholders in education (Chiu, 2023; Zawacki-Richter et al., 2019).

Certainly, the first step in this regard is to update teacher training programs in higher education. This way, it will be possible to train the next generation of educators who are familiar with such technologies, aware of their risks, and equipped with the skills to use them (Grassini, 2023). Teachers starting their careers with the knowledge and skills acquired through this education will contribute to the healthier implementation of these processes. Additionally, existing teachers in the education system need to undergo comprehensive in-service training in this context (Chiu, 2023; Yau et al., 2022). Similarly, school administrators should receive ongoing training on the potentials and risks of these systems. Thus, teachers and education administrators will not only be aware of the benefits these systems can bring to education and learn how to use them in their work but also act more consciously in the face of potential risks. On the other hand, the use of generative AI systems, especially those like ChatGPT, makes it essential to adopt a more inclusive and interdisciplinary perspective for every subject. Therefore, it is

crucial for teachers to gain an interdisciplinary perspective related to their fields and continuously update relevant skills to ensure synchronization (Chiu, 2023).

AI systems have long been known to have a bias issue and can reproduce biases based on societal factors such as religion, culture, gender, race, etc., through training data. Therefore, careful attention is needed to address these biases when using such systems in education. Otherwise, the risk of these biases becoming widespread and persistent through the use of such approaches in education increases. Additionally, considering that the responses generated by these systems are not always accurate and reliable, it is essential to support students with new skills, such as media literacy, that encourage them to verify the accuracy of this information (Chiu, 2023).

One of the profound changes that should be implemented in education systems is the transformation of existing assessment and evaluation approaches to be more robust and accurate after the use of AI systems. However, this transformation should go beyond being a one-time change; it should be continuous. Given the continuous and dramatically evolving nature of AI systems, each new approach will need constant updates. Particularly, taking serious steps to measure the extent to which students contribute to the preparation of their assignments will also reduce unethical behavior among students. Similarly, accurate measurement and evaluation of performances are crucial. One of the significant challenges in this context is the potential masking of failures for students who are actually unsuccessful due to these systems. This problem could delay interventions that could compensate for failures, leading to the perpetuation of failures and potentially increasing unexpected absenteeism and dropout rates.

Finally, the increasing use of AI systems in the education system requires rapid changes in the role of teachers in education. The role of teachers is gradually evolving towards process management. In fact, the workload and responsibilities of teachers have significantly increased. The transition from conventional teaching to new approaches is particularly challenging for teachers. Teachers are expected to learn and actively use new systems in the context of all their benefits and limitations. While teachers are expected to incorporate these systems into the learning environment interactively and innovatively, they also need to actively and adaptively support the development of each student. In particular, they should be able to actively monitor and track to what extent each student completes assignments and projects with the help of these systems. Therefore, the responsibilities of teachers have significantly increased at this point. Hence, ensuring that this evolution is carried out correctly and swiftly can prevent misconceptions about the inadequacy of the teacher's role, ultimately avoiding cutbacks in employment due to questioning the need for teachers.

REFERENCES

Acemoğlu, D., & Restrepo, P. (2018). Artificial intelligence, automation and work. *NBER Working Paper 24196.* National Bureau of Economic Research, Cambridge.

Aghion, P., & Howitt, P. (1990). A model of growth through creative destruction. *NBER Working Paper 3223*. National Bureau of Economic Research, Cambridge.

Aghion, P., & Howitt, P. (1994). Growth and unemployment. *Review of Economic Studies*, *61*, 477–494. https://doi.org/10.2307/2297900

Al-Worafi, Y. M., Hermansyah, A., Goh, K.W., & Ming, L.C. (2023). Artificial intelligence use in university: Should we ban ChatGPT? *Preprints.org 2023*.

Aquino, Y. S. J. (2023). Making decisions: Bias in artificial intelligence and data-driven diagnostic tools. *Australian Journal of General Practice*, 52(7), 439-442. https://doi.org/10.31128/ajgp-12-22-6630

Arntz, M., Gregory, T., & Zierahn, U. (2016). The risk of automation for jobs in OECD countries: A comparative analysis. *Social, Employment and Migration Working Paper 189*. OECD Publishing, Paris. https://doi.org/10.1787/1815199X

Atlas, S. (2023). *ChatGPT for higher education and professional development: A guide to conversational AI*. Available online: https://digitalcommons.uri.edu/cba_facpubs/548.

Babitha, M. M., & Sushma, C. (2022). Trends of artificial intelligence for online exams in education. *International Journal of Early Childhood Special Education*, 14, 2457–2463. doi: 10.9756/INT-JECSE/V14I1.290

Bartelsman, E., Haltiwanger, J., & Scarpetta, S. (2004). *Microeconomic evidence of creative destruction in industrial and developing countries*. World Bank, Washington DC.

Bašic, Ž., Banovac, A., Kružic, I., & Jerkovic, I. (2023). Better by you, better than me, ChatGPT3 as writing assistance in students essays. *arXiv*: 2302.04536.

Bhutoria, A. (2022). Personalized education and Artificial Intelligence in the United States, China, and India: A systematic review using a Human-In-The-Loop model. *Computers and Education: Artificial Intelligence, 3*, 100068.

Boyd, D., & Crawford, K. (2012). Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. *Information, Communication & Society*, *15*(5), 662–679. https://doi.org/10.1080/1369118X.2012.678878

Brinkmann, L., Baumann, F., Bonnefon, J. F. et al. (2023). Machine culture. *Nature Human Behavior*, 7(11), 1855-1868. https://doi.org/10.1038/s41562-023-01742-2

Bulathwela, S., Pérez-Ortiz, M., Holloway, C., Cukurova, M., & Shawe-Taylor, J. (2024). Artificial intelligence alone will not democratise education: On educational inequality, techno-solutionism and inclusive tools. *Sustainability*. *16*(2), 781.

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, *8,* 75264-75278. https://doi.org/10.1109/ACCESS.2020.2988510

Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two decades of artificial intelligence in education: Contributors, collaborations, research topics, challenges and future directions. *Educational Technology & Society*, 25(1), 28-47. https://www.jstor.org/stable/48647028

Chiu, T. K. F. (2023). The impact of generative AI (GenAI) on practices, policies and research direction in education: A case of ChatGPT and Midjourney. *Interactive Learning Environments*, 1-17. https://doi.org/10.1080/10494820.2023.2253861

Conijn, R., Kahr, P., & Snijders, C. (2023). The effects of explanations in automated essay scoring systems on student trust and motivation. *Journal of Learning Analytics*, 10, 37–53. https://doi.org/18608/jla.2023.7801

Cotton, D. R., Cotton, P. A., & Shipway, J.R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 1–12. https://doi.org/10.1080/14703297.2023.2190148

Crawford, K., Calo, R. (2016). There is a blind spot in AI research. *Nature*, 538, 311-313. https://doi.org/10.1038/538311a

De Cremer, D., & Kasparov, G. (2021). AI should augment human intelligence, not replace it. *Harvard Business Review*, 18.

Denecke, K., Glauser, R., & Reichenpfader, D. (2023). Assessing the potential and risks of ai-based tools in higher education: Results from an eSurvey and SWOT analysis. *Trends in Higher Education*, *2*(4), 667-688.

Dignum, V. (2021). The role and challenges of education for responsible AI. *London Review of Education*, 19(1), 1-11. https://doi.org/10.14324/LRE.19.1.01

Elgammal, A., Liu, B., Elhoseiny, M., & Mazzone, M. C. (2017). Creative adversarial networks, generating "art" by learning about styles and deviating from style norms. *arXiv:*1706.07068.

Farazouli, A., Cerratto-Pargman, T., Bolander-Laksov, K., & McGrath, C. (2023). Hello GPT! Goodbye home examination? An exploratory study of AI chatbots impact on university teachers' assessment practices. *Assessment & Evaluation in Higher Education*. https://doi.org/10.1080/02602938.2023.2241676

Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. (2023). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International*, 1–15. https://doi.org/10.1080/14703297.2023.2195846

Fitria, T. N. (2021). "Grammarly" as AI-powered English writing assistant: Students' alternative for writing English. *Metathesis: Journal of English Language, Literature, and Teaching*, 5(1), 65-78. https://doi.org/10.31002/metathesis.v5i1.3519

Frank, M. R., Autor, D., Bessen, J. E. et al. (2019). Toward understanding the impact of artificial intelligence on labor. *PNAS*, 116(14), 6531-6539. https://doi.org/10.1073/pnas.1900949116

Gangadharbatla, H. (2022). The role of AI attribution knowledge in the evaluation of artwork. *Empirical Studies of the Arts*, 40, 125–142. https://doi.org/10.1177/0276237421994697

García-Gorrostieta, J. M., López-López, A., & González López, S. (2018). Automatic argument assessment of final project reports of computer engineering students. *Computer Applications in Engineering Education*, 26(5), 1217-1226. https://doi.org/10.1002/cae.21996

Gilson, A., Safranek, C. W., Huang, T., Socrates, V., Chi, L., Taylor, R. A., & Chartash, D. (2023). How does ChatGPT perform on the United States medical licensing examination? The implications of large language models for medical education and knowledge assessment. *JMIR Medical Education*, 9, e45312. https://doi.org/10.2196/45312

Grassini, S. (2023). Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. *Education Sciences*, *13*, 692.

Halaweh, M. (2023). *ChatGPT in education: Strategies for responsible implementation*. Bastas: Tokyo, Japan.

Harari, Y. N. (2017). Reboot for the AI revolution. *Nature*, *550*(19), 324-327. https://doi.org/10.1038/550324a

Howard, J. (2019). Artificial intelligence: Implications for the future of work. *American Journal of Industrial Medicine*, 62, 917–926. https://doi.org/10.1002/ajim.23037

Huang, L. (2023). Ethics of artificial intelligence in education: Student privacy and data protection. *Science Insights Education Frontiers*, *16*(2), 2577–2587.

Humble, N., & Mozelius, P. (2019) Artificial intelligence in education - a promise, a threat or a hype? In: P. Griffiths and M. N. Kabir (Eds.), *Proceedings of the European Conference on the impact of artificial intelligence and robotics*, EM-Normandie Business School Oxford, UK, 31 October-1 November 2019, ECIAIR.19.005 (pp. 149-156).

Kamalov, F., Santandreu Calonge, D., & Gurrib, I. (2023). New era of artificial intelligence in education: Towards a sustainable multifaceted revolution. *Sustainability*, *15*(16), 12451.

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D. et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Katz, D. M., Bommarito, M. J., Gao, S., & Arredondo, P. (2023). GPT-4 passes the bar exam. Available at *SSRN*: 4389233.

Khan, R. A., Jawaid, M., Khan, A. R., Sajjad, M. (2023). ChatGPT—Reshaping medical education and clinical management. *Pakistan Journal of Medical Sciences*, 39, 605–607. https://doi.org/12669/pjms.39.2.7653

King, M. R. A. (2023). Conversation on artificial intelligence, chatbots, and plagiarism in higher education. *Cellular and Molecular Bioengineering*, *16*, 1–2. https://doi.org/10.1007/s12195-022-00754-8

Koltovskaia, S. (2020). Student engagement with automated written corrective feedback (AWCF) provided by Grammarly: A multiple case study. *Assessing Writing*, 44, 100450. https://doi.org/10.1016/j.asw.2020.100450

Köbis, N., & Mossink, L. D. (2021). Artificial intelligence versus Maya Angelou: Experimental evidence that people cannot differentiate AI-generated from human-written poetry. *Computers in Human Behavior*, 114, 106553. https://doi.org/10.1016/j.chb.2020.106553

Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, *13*, 410. https://doi.org/10.3390/educsci13040410

Marshall, R., Pardo, A., & Smith, D., & Watson, S. (2022). Implementing next generation privacy and ethics research in education technology. *British Journal of Educational Technology, 53*(4), 737-755.

Mbakwe, A. B., Lourentzou, I., Celi, L. A., Mechanic, O. J., & Dagan, A. (2023). ChatGPT passing USMLE shines a spotlight on the flaws of medical education. *PLoS Digital Health*, 2, e0000205. https://doi.org/10.1371/journal.pdig.0000205

Mehrabanian, M., & Zariat, Y. (2023). ChatGPT passes anatomy exam. *Br Dent J, 235*, 295.

Mhlanga, D. (2023). Open AI in education, the responsible and ethical use of ChatGPT towards lifelong learning. *SSRN*. https://doi.org/10.2139/ssrn.4354422

Miao, H., & Ahn, H. (2023). Impact of ChatGPT on interdisciplinary nursing education and research. *Asian/Pacific Island Nursing Journal*, 7(1), e48136. https://doi.org/10.2196/48136

Mizumoto, A., & Eguchi, M. (2023). Exploring the potential of using an AI language model for automated essay scoring. *Research Methods in Applied Linguistics, 2*(2), 100050.

Mogali, S. R. (2023). Initial impressions of ChatGPT for anatomy education. *Anatomical Sciences Education*, 1–4. https://doi.org/10.1002/ase.2261

Morgan, H. (2021). Conducting a qualitative document analysis. *The Qualitative Report*, 27(1), 64-77. https://doi.org/10.46743/2160-3715/2022.5044

Naik, R. R., Landge, M. B., & Mahender, C. N. (2015). A review on plagiarism detection tools. *International Journal of Computer Applications*, 125, 16–22.

Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of artificial intelligence powered digital writing assistant in higher education: Randomized controlled trial. *Heliyon*, 7(5), e07014. https://doi.org/10.1016/j.heliyon.2021.e07014

Newman, M., Gough, D. (2020). Systematic reviews in educational research: Methodology, perspectives and application. In: Zawacki-Richter, O., Kerres, M., Bedenlier, S., Bond, M., Buntins, K. (eds) *Systematic reviews in educational research*. Springer VS, Wiesbaden.

O'Neil, C. (2016). *Weapons of math destruction: How big data increases inequality and threatens democracy*. Crown Books.

Özer, M., Suna, H. E., Çelik, Z., & Aşkar, P. (2020). Covid-19 salgını dolayısıyla okulların kapanmasının eğitimde eşitsizlikler üzerine etkisi. *İnsan ve Toplum*, 10(4), 217-246. https://doi.org/10.12658/M0611

Özer, M., & Suna, H. E. (2020). Covid-19 salgını ve eğitim. In M. Şeker, A. Özer & C. Korkut (Eds.), *Küresel salgının anatomisi: İnsan ve toplumun geleceği* (pp. 171-192). TÜBA.

Özer, M., Suna, H. E., Perc, M., Şensoy, S., & İlikhan, S. U. (2022). Turkey's transition to face-to-face schooling during the COVID-19 pandemic. *Turkish Journal of Medical Sciences*, *52*, 529-540. https://doi.org/10.55730/1300-0144.5343

Özer, M. (2023a). The Matthew effect in Turkish education system. *Bartın University Journal of Faculty of Education*, 12(4), 704-712. https://doi.org/10.14686/buefad.1359312

Özer, M. (2023b). Matta etkisi. *Uluslararası Yönetim İktisat ve İşletme Dergisi*, 19(4), 974-984. https://doi.org/10.17130/ijmeb.1374798

Pajarinen, M., Rouvinen, P., & Ekeland, A. (2015). Computerization threatens one-third of Finnish and Norwegian employment. *ETLA Brief*, 34.

Peng, H., Ma, S., & Spector, J. M. (2019). Personalized adaptive learning: An emerging pedagogical approach enabled by a smart learning environment. *Smart Learning Environments, 6*(1), 1-14.

Perc, M., Özer, M., & Hojnik, J. (2019). Social and juristic challenges of artificial intelligence. *Palgrave Communications*, *5,* 61. https://doi.org/10.1057/s41599-019-0278-x

Piano, S. L. (2020). Ethical principles in machine learning and artificial intelligence: cases from the field and possible ways forward. *Humanities & Social Sciences Communications*, *7*, 9. https://doi.org/10.1057/s41599-020-0501-9

Rahwan, I. (2018). Society-in-the-loop: Programming the algorithmic social contract. *Ethics and Information Technology*, *20*(1), 5-14.

Ramesh, D., & Sanampudi, S. K. (2022). An automated essay scoring systems: a systematic literature review. *Artif Intell Rev, 55*, 2495–2527.

Rubinstein, Y. (2020). Uneasy listening: Towards a hauntology of AI-generated 835 music. *Resonance: The Journal of Sound and Culture*, 1, 77–93. https://doi.org/10.1525/res.2020.1.1.77

Rudolph, J., Tan, S., Tan, S. C. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning & Teaching*, 6(1), 1-22. https://doi.org/10.37074/jalt.2023.6.1.9

Seo, K., Tang, J., Roll, I. *et al.* (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *Int J Educ Technol High Educ, 18*, 54. https://doi.org/10.1186/s41239-021-00292-9

Shiri, A. (2023). ChatGPT and academic integrity. *Information Matters*, 3(2), 1-5. https://doi.org/10.2139/ssrn.4360052

Skavronskaya, L., Hadinejad, A., & Cotterell, D. (2023). Reversing the threat of artificial intelligence to opportunity: A discussion of ChatGPT in tourism education. *Journal of Teaching in Travel & Tourism*, 23, 253–258.. https://doi.org/1080/15313220.2023.2196658

Sok, S., & Heng, K. (2023). ChatGPT for education and research: A review of benefits and risks. *Cambodian Journal of Educational Research*, 3(1), 110-121. https://doi.org/10.2139/ssrn.4378735

Stahl, B. C. (2023). Embedding responsibility in intelligent systems: From AI ethics to responsible AI ecosystems. *Scientific Reports*, *13,* 7586. https://doi.org/10.1038/s41598-023-34622-w

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21(4), 360-407. https://doi.org/10.1598/RRQ.21.4.1

Suleyman, M. (2023). *The coming wave: Technology, power, and the twenty-first century's greatest dilemma*. Crown: New York.

Suna, H. E., Tanberkan, H., Gür, B.S., Perc, M., & Özer, M. (2020). Socioeconomic status and school type as predictors of academic achievement. *Journal of Economy Culture and Society*, 61, 41-64. https://doi.org/10.26650/JECS2020-0034

Suna, H. E., Özer, M., Şensoy, S., Gür , B. S., Gelbal , S., & Aşkar , P. (2021). Determinants of academic achievement in Türkiye. *Journal of Economy Culture and Society*, 64, 143-162. https://doi.org/10.26650/JECS2021-934211

Suna, H. E., & Özer, M. (2022). The relationship of preschool attendance with academic achievement and socioeconomic status in Türkiye. *Journal of Measurement and Evaluation in Education and Psychology*, 13(1), 54-68. https://doi.org/10.21031/epod.1060460

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A. et al. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, *10*, 15. https://doi.org/10.1186/s40561-023-00237-x

Trojer, L., Ambele, R. M., Kaijage, S. F., & Dida, M. A. (2022). A review of the development trend of personalized learning technologies and its applications. *International Journal of Advances in Scientific Research and Engineering*, 8, 75–91. https://doi.org/10.31695/IJASRE.2022.8.11.9

Tsai, S. C., Chen, C. H., Shiao, Y. T., Ciou, J. S., & Wu, T. N. (2020). Precision education with statistical learning and deep learning: A case study in Taiwan. *International Journal of Educational Technology in Higher Education*, *17*, 12. https://doi.org/10.1186/s41239-020-00186-2

Ulnicane, I., & Aden, A. (2023). Power and politics in framing bias in artificial intelligence policy. *Review of Policy Research*, 40, 665-687. https://doi.org/10.1111/ropr.12567

UNESCO (2019). *Artificial intelligence in education: Challenges and opportunities for sustainable development*. UNESCO Publishing. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000366994

Villegas-Ch, W., Arias-Navarrete, A., & Palacios-Pacheco, X. (2020). Proposal of an architecture for the integration of a Chatbot with artificial intelligence in a smart campus for the improvement of learning. *Sustainability*, *12*, 1500. https://doi.org/10.3390/su12041500

Wang, L., Lyu, C., Ji, T., Zhang, Z., Yu, D. et al. (2023). Document-level machine translation with large language models. *arXiv*:2304.02210. https://doi.org/10.18653/v1/2023.emnlp-main.1036

Welle, D. (2023). *ChatGPT is changing education, AI experts say — but how?*. https://news.abs-cbn.com/spotlight/01/25/23/chatgpt-is-changing-education-ai-experts-say-but-how

Yau, S., Chai, C. S., Chiu, T. K. F., Meng, H., King, I., & Yam, Y. (2022). A phenomenographic approach on teacher conceptions of teaching artificial intelligence (AI) in K-12 schools. *Education and Information Technologies*, *28*, 1041–1064. https://doi.org/10.1007/s10639-022-11161-x

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1-27. https://doi.org/10.1186/s41239-019-0171-0