

81. Correlation between artificial intelligence in education and teacher self-efficacy beliefs: a review

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Abstract

Teachers' self-efficacy (TSE) beliefs affect not just their performance and motivation, but also the academic success of their pupils. As a result, researchers focused on the crucial self-beliefs of educators and its origins. This review article seeks to fill a gap regarding the correlation of teacher self-efficacy and its relation with the recently developed and ever-growing artificial intelligence (AI) technology by combining literature reviews from both of the topics to get a whole understanding and provide a solid framework for the suggestions of this paper. In addition, examples of how AI can be used in the classroom and the skills required for this use are mentioned and linked to educators' self-efficacy beliefs. Findings of literature review suggested that teacher self-efficacy is affected by various factors, but no studies which measured the correlation between AI literacy and teacher self-efficacy beliefs were found, thus, it is suggested that future research should be conducted to measure the correlation between AI literacy and teacher self-efficacy beliefs. Based on studies on these main topics that were reviewed separately, following implications were reached: (1) identifying ways that educators can take AI's advantage to improve their work efficiency rather than just relying on the tool to get the job done is crucial, (2) Policymakers should set up both pre-service and in-service training programs because they might offer novice teachers and seasoned educators the chance to learn through observational learning to increase their teacher self-efficacy regarding the use of AI in education.

Keywords: Teacher self-efficacy, artificial intelligence (AI), AI in education, ChatGPT, educational technologies

Eğitimde yapay zeka ve öğretmen öz yeterlik inancı arasındaki ilişkinin incelenmesi

Öz

Öğretmenlerin öz yeterlik inançları sadece kendi performans ve motivasyonlarını değil, aynı zamanda öğrencilerinin akademik başarılarını da etkilemektedir. Bunun sonucu olarak, araştırmacılar eğitimcilerin öz inançlarına ve bunun kökenlerine odaklanmıştır. Bu derleme makalesi, öğretmen öz yeterliliği ve bunun yakın zamanda geliştirilen ve sürekli büyüyen yapay zeka teknolojisi ile ilişkisi konusundaki boşluğu, her iki konudaki literatür taramalarını bir araya getirerek doldurmayı ve bu makalenin önerileri için sağlam bir çerçeve sağlamayı amaçlamaktadır. Bunun yanı sıra, yapay zekanın sınıfta nasıl kullanılabileceğine dair örnekler ve bu kullanımın gerektirdiği becerilerden bahsedilerek, eğitimcilerin öz yeterlik inançları ile bağlantı kurulmuştur. Literatür taramasının bulguları, öğretmen öz yeterliliğinin çeşitli faktörlerden etkilendiğini göstermiştir, ancak

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öğretmenlerin yapay zeka kullanma seviyesi ile öğretmen öz yeterlilik inançları arasındaki ilişkiyi ölçen herhangi bir çalışmaya rastlanmamıştır, bu nedenle, gelecekte yapay zeka kullanma seviyesi ile öğretmen öz yeterlik inançları arasındaki korelasyonu ölçmek için arařtırmalar yapılması önerilmektedir. Ayrı ayrı literatür taramaları sonucu incelenen çalışmalara dayanarak, ařağıdaki çıkarımlar yapılmıştır: (1) eğitimcilerin yapay zekanın avantajlarını kullanabilecekleri metod ve yollar bulmak önemlidir, (2) Program belirleyen yetkili kişiler hem hizmet öncesi hem de hizmet içi yapay zeka eğitim programları oluşturmalıdır, çünkü yeni öğretmenlere ve diğeri geri kalan deneyimli eğitimcilere eğitimde yapay zeka kullanımına ilişkin öğretmen öz yeterliliklerini artırmak için gözlemsel öğrenme yoluyla öğrenme şansı sunabilirler.

Anahtar kelimeler: Öğretmen öz-yeterliğı, yapay zeka, eğitim ve yapay zeka, ChatGPT, eğitim teknolojileri

1- Introduction

Self-efficacy is a crucial term for both psychologists and educators and it is defined as “a person’s self-evaluation of his ability to execute the courses of action required for the successful attainment of a certain goal” (Bandura, 1997, p. 3). Thus, it is an important part of educational process and many research related to it has been conducted by academics and researchers. The interest in researching self-efficacy led to different branches across different disciplines. In social sciences, one of the branches is teacher self-efficacy. Compeau and Higgins (1995) stated that “students with a high computer self-efficacy are more likely to choose and participate in computer-related activities, expect success in these activities, persist and employ effective coping behaviors when encountering difficulty, and exhibit higher levels of performance than the students with a low computer self-efficacy” and the same applies for teacher self-efficacy beliefs as well. It also needs to be stated that a teacher can be confident but not self-efficacious regarding teaching. The term self-efficacy also differs from self-esteem because self-esteem is reflection of views of others regarding one’s self-confidence. A teacher may be performing very well at a task but may not have the high self-efficacy level on that task. However, teachers who see themselves competent in their professions might have high self-efficacy beliefs and these beliefs might reflect positively on their job satisfaction (Kasalak & Dagyar, 2020). Job satisfaction is also one of the factors of teacher “burnout” which is a term used in literature to refer to exhaustion and loss of commitment to the job of teaching. Maslach & Jackson (1981) defined burnout as a syndrome that occurs through stress experienced due to heavy work. Even though teachers’ professional identities differ based on their personalities, their well-being cannot be excluded from the context they work in and job satisfaction, self-efficacy and the teacher burnout are all interrelated terms used by researchers to define different conditions for teachers. The present study however, focuses on self-efficacy and specifically teacher self-efficacy as stated in the beginning of the article. Several factors influence teacher self-efficacy but the present paper aims to look at particularly how use of artificial intelligence in the class affects teacher self-efficacy, thus, the author aims to combine the literature of teacher self-efficacy together with artificial intelligence in education to combine these different subject fields and assess their correlation with each other.

Use of artificial intelligence in education

Automated software with human-like intelligence called “artificial intelligence” (AI) has been around since the second half of the 20th century. When this term is used, one might think of super computers, advanced machines with super-fast processing speeds, though, first coinage of the AI term was made in

Dartmouth College Conference which was held in 1956 (Popenici & Kerr, 2017). Since its establishment, it impacted various fields, education being one of them. AI has potential to change not just education but society and professions itself. Indeed, it is inevitable that some of the professions will be affected by the rise of artificial intelligence and the teaching job can be one of them. Even though that is the case, AI is often named as a remedy (Davies et al., 2020; OECD, 2021; Seldon & Abidoye, 2018) to many of education's key issues (such as the shortage of competent teachers, poor student achievement, and the widening performance gap between wealthy and poor students), though rarely with convincing proof (Miao & Holmes, 2021), thus, the present study aims to provide a detailed outline of research conducted by academics and researchers regarding the use of AI in education. With the advancements in technology, artificial intelligence is being constantly updated and is growing at a big rate which in turn leads to an increasing demand for researching artificial intelligence topic to keep up with the latest trends. Latest trend in the AI world is ChatGPT, which stormed the world with its recent release. As it is recently released, it is hypothesized that it will take some time to be adapted by educators around the world. As is the goal of this review paper, in the following chapter, literature reviews regarding both teacher self-efficacy, general self-efficacy and AI in education is provided.

2- Literature review

2.1. Social cognitive theory and self-efficacy theory

Various explanations and various theories have been provided as to how people acquire information. A number of scientists put their views forward emphasizing the importance of cognitive structures, including Albert Bandura. Social Cognitive Theory (SCT), developed by Bandura (1986, 1997), proposes that human beings learn from their environment. The theory suggests that modeling, imitation, attitudes and reactions of others influence human learning and behavior. So according to this view, humans are models who influence and are influenced by their environments at the same time. According to Bandura's social perspective, "human agents" have certain capabilities that make them human beings. These capabilities namely are "symbolizing", "forethought", "vicarious(modeled) learning", "self-regulation" and "self-reflection". By using their symbolic abilities, individuals may make sense of their surroundings, create action plans, and come up with creative solutions to issues. By symbolizing, people can also store the knowledge needed to direct their future actions. They are able to mimic observed behavior as a result of this process. (Pajares, 2002.) People also possess the ability to plan and forethink actions and behaviors which let them regulate their behavior and actions. Human beings are able to plan alternatives so they can expect and predict the results of an action without taking that action. Through interaction, support, observation and scaffolding from a more knowledgeable other (Topping, 2005), it is said that students learn vicariously (through other's experience). The observation serves as a template for future action and is symbolically coded. The mechanisms of attention, retention, production, and motivation control observational learning. The ability to actively monitor a model's actions is referred to as attention. Observed behaviors, on the other hand, can only be imitated if they are kept in memory, a process made possible by the ability of humans to represent. (Pajares, 2002.) Self-regulatory mechanisms within people provide them the capacity to adjust their behavior on their own desire. People's ability to accurately and consistently self-observe and self-monitor their own actions and behavior, make judgments about their choices, actions, and attributions to their own behavior through the self-regulatory process, all play a role in how and to what extent they self-regulate in SCT. Bandura (1986) himself called the self-reflection capability "evidently human". Consequently, it is a key component of social cognitive theory. Self-reflection helps people make sense of their experiences,

analyze their own thoughts and self-beliefs, perform self-evaluation, and adjust their behavior as needed.

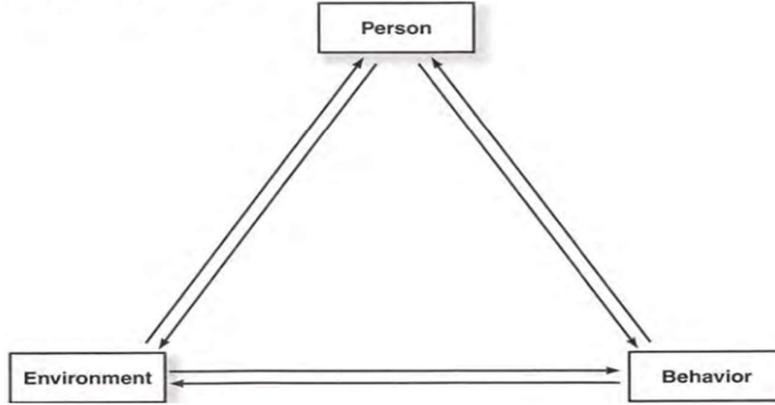


Figure 1. Influence Loop in Social Cognitive Theory (Stajkovic & Luthans, 2002)

SCT also mentions the importance of reward and punishment related to different behaviors. It suggests that if a behavior is rewarded, it is likely to be repeated by the one who gets the reward and vice versa for the punishment which is less probable to be imitated. This reinforcement system plays a big role in education as well. Figuratively, if a teacher rewards his/her student that student is more likely to be motivated to participate in the class in the future and if the teacher punishes a behavior in the class, it is less likely to happen again.

2.2. Self-Efficacy theory

Self-efficacy, defined as one's belief of his own ability to perform a task, is developed under SCT and a substantial amount of research in observational studies demonstrate that self-efficacy expectations "typically predict behavior" (Luszczynska & Schwarzer, 2005). The term should not be confused with self-confidence though. While the latter refers to the general view of one's approach to general tasks, self-efficacy is related to something very specific and can change depending on the context. An individual with a high feeling of self-efficacy might experience less fear of not succeeding than an individual with a low sense of self-efficacy, so, self-efficacy beliefs have an impact on a person's ability to think either positively or negatively, in a way that can be self-enhancing or self-debilitating (Nabavi, 2012). According to Bandura (1977), the four basic sources from which self-efficacy beliefs are formed are mastery experiences, vicarious experiences, social persuasion, and emotional and physical states. Mastery experiences reflect the experiences gained from the previous encounters with the subject at hand. If a person was successful in a previous attempt while carrying out a task, that person is more likely to be self-efficacious when encountering the same subject. People may lack the confidence to carry out a certain task and they move onto learning by observing others and thus this type of learning is called observational learning. When the task is relatively new, Bandura (1997) reported that an observational learning may have a significant impact on the growth of self-efficacy. Additionally, when the model or comparison group is thought to be similar to the individual, vicarious experiences are more powerful. Self-efficacy beliefs also tend to get affected by critical feedback in the shape of social persuasions.

According to Bandura (1997), the perceived competence or validity of the person giving the feedback frequently acts as a bridge between social persuasions and changes in one's level of self-efficacy. So, the impact of praise depends on the message's framing as well as the person who delivers it. Encouragements that are merely automatic applause or hollow motivational sermons are unlikely to have a significant impact (Pajares & Valiante, 2006). On the other hand, detailed and honest comments can have a significant impact on how one develops their perception of self-efficacy (Schunk, 1984; Hattie & Timperley, 2007). When deciding what they can achieve in a particular circumstance, people often take their own physiological and emotional states into account. These states consist of stress, exhaustion, anxiety, and state of mind. One's interpretation of their self-efficacy may also be influenced by the severity of these states. Cassady & Johnson (2002), stated in their work that that optimal performance results from moderate levels of excitement which is line with what the pioneer of the field Bandura (1997) stated. Among the primary sources of self-efficacy beliefs, mastery experiences generally have the greatest impact on the development of self-efficacy because they are the most authentic depiction of a person's skills (Bandura, 1997). Having discussed the theoretical background of self-efficacy theory, now this paper will address artificial intelligence and its use in education.

2.3. Artificial intelligence

For centuries, many scientists and field experts have been inspired by the idea of creating an intelligent machine that possessed similar intelligence that of human beings. With the evolution of information and computer technologies since the second half of the 20th century and advancement in technology as a whole led to creation of artificial intelligence. Artificial intelligence (AI) refers to a technology that enables automated machines to solve issues, respond to inquiries, devise plans, and carry out a variety of other tasks that normally require human intelligence (Coppin, 2004). Besides that, Whitby (2008) also stated his perspective on the definition of AI as “the investigation of intelligence behavior in humans, animals, and machines with the goal of converting that behavior into an item such as computers and computer-related technology.” Based on these definitions, it can be concluded that artificial intelligence is the result of advances and developments in computers, computer-related technologies, machines, and information and communication technologies which provides computers the ability to carry out nearly human-like tasks. It also should be noted that data is vital for AI. With more data, AI application results become more precise. To develop its intelligence (using machine learning, for example), AI needs data. Given that big data paves the way for AI to realize its full potential, it is reasonable to conclude that data-driven AI cannot exist without big data. Big data can be defined as “sets of data that are too large for standard database software tools to capture, store, manage, and analyze” (Manyika, 2011). The ever-growing, data-driven AI brings about some negative discussions as well. As much useful as it is, it is also regarded as a scary phenomenon for some parts of the society, as well. This fearful perspective of people stems from the broad potential of the AI concept itself, which has a potential to replace many professions around the world. Leaving that up for debate for later, the use of AI has the capability to alter how education is being set up the bring new generations up around the world.

2.4. AI and education

AI itself is generally associated with being an assistant computer program that carries out tasks like enhancing phone cameras, filtering e-mails, providing information about the weather and news stories, an algorithm-driven system that adjusts the content to your preference (like the one in YouTube), or automated vehicles that drive themselves without commands from human beings. Even though these are different roles for different AI types in different sectors, it is an undeniable fact that AI is also widely

used in education sector as well. Recent years have seen a substantial increase in interest in AI in education, with more educational institutions and organizations looking into the potential advantages of AI-driven technology (Dwivedi et al., 2021; Su & Yang, 2022). However, the history of AI in education surprisingly goes back to the 1970s when the early attempts of replacing teachers with super computers began. Between 1982 and 1984, the educational system started utilizing AI, which allowed students who received both direct human instruction and AI teaching to outperform those who did not (Hao, 2019). Nowadays, AI in education has opened up new possibilities for creating useful learning activities and improving technology-enhanced educational settings or applications. However, the majority of scholars and practitioners in the disciplines of technology and education still struggle to put appropriate practices or systems in place (Kay, 2012). With the release of ChatGPT AI tool which is created by OpenAI using the GPT language model technology, general audience has become more familiar with the term "AI" than before and that groundbreaking popularity effect that stormed the world in November 2022 can help reduce the struggle majority of scholars and practitioners feel as it gets more widespread day by day with the constant updates it is getting. ChatGPT is a highly developed chatbot that can handle a variety of text-based requests, including simple question-answering and more difficult ones like writing complex writing pieces and assisting people through tough situations (Liu et al., 2021). A research center called OpenAI began operation in 2015 (Brockman et al., 2016). This lab has advanced promptly in the creation of AI technologies and has made a variety of machine learning products available to the public, such as ChatGPT and DALL-E (Devlin et al., 2018). Early in 2022, DALL-E, a machine learning system that creates innovative graphics based on user inputs, attracted a great deal of public interest (Marcus et al., 2022). The general population's access to DALL-E has also helped ChatGPT grow quickly; within a week of its debut, it had more than one million unique users (Mollman, 2022). The GPT acronym in ChatGPT's name refers to a language model called Generative Pre-Trained Transformer that was invented by OpenAI and is capable of producing response text that is almost identical to the language used by humans (Dale, 2021). A language model is a special kind of artificial intelligence that is trained to provide data similar to language utilized by societies. According to research, (Erhan et al., 2010; Budzianowski & Vulić, 2019) A two-step procedure is used to refine the ideas supporting GPT: generative unsupervised pre-training using unlabeled data, followed by discriminative supervised fine-tuning to boost performance on certain tasks. The model learns organically during the pre-training phase, similar to how a human may learn in a new situation, whereas the fine-tuning phase involves more directed and controlled refinement by the developers of the model (Radford et al., 2018). Leaving the complicated technical side of the ChatGPT aside, it is a capable tool that can revolutionize and impact society as a whole. By breaking down a main topic into smaller subtopics and having each section written by GPT, an entire scholarly article can be produced using the tool. It is even possible to produce a complete article in a matter of seconds with only a small amount of input from a researcher using the full version of ChatGPT that supports longer responses (Lund & Wang, 2023). As a matter of fact, in their research Gordijn and Have (2023) claimed that writing academic papers will be part of the other things that AI will outperform humans. Therefore, it is an undeniable fact that GPT language model technology is an impactful technological tool for tasks like analysis of a text and processing information. However, it does have its limitations as well. One of the main limitations of GPT stems from it being a data-driven technology. As mentioned previously, its language model learns from large datasets which can lead to biases or stereotyping by the chatbot which was shown by the works of Dale (2017); Lucy & Bamman (2021). Output generated by the GPT may be harmful and offensive for some and besides that, as the GPT cannot always get the context, it may produce unrelated responses related to the original prompt given by the user. Added to that, since they require excessively large amounts of data and computer resources to be trained, it can be really challenging and expensive to train GPT models. Furthermore,

there are worries regarding the privacy of the people whose data was used to train the model as well as the possibility that the model can be put to bad use. For example, according to a paper by Choi et al., (2023) ChatGPT did well on a law exam and earned a passing grade which raises questions regarding the reliability of responses given to homework, tasks and examinations by students. Likewise, Wang et al. (2023) looked into how ChatGPT performed over the course of a two-year period on the Chinese National Medical Licensing Examination, which is composed of four units and discovered that ChatGPT generated answers that are at or near the required passing threshold for all three parts of the US Medical Licensing Exam. ChatGPT also brings ethical questions as well, for example, ChatGPT has already been cited as an author in studies across several disciplines (Frye, 2022). Concerns over an AI chatbot producing science just like a scholar does were expressed by several scholars and people on the internet. Qasem (2023), in his paper, mentioned a field expert who expresses his thoughts on the topic as:

ChatGPTs will cause researchers and students to form the bad habit of relying more on pre-written materials and ignoring in-depth reading and investigating the research facts themselves. Second, as a result, ChatGPTs would also cause researchers and students to become more machine-dependent and less creative when conducting and producing research papers and tasks. Thirdly, ChatGPTs encourage students and researchers to be lazy and simply rehash previous work. Fourth, the lack of developing original academic papers would result from ChatGPTs' blind dependence without academic boundaries. There will be a considerable likelihood of the dissemination of false and duplicate academic publications. Let alone, scholarly writing and research ethics are out of control. Fifth, the growing concern of many scholars is that ChatGPTs would lead to possibility of plagiarism increase and the less control of ChatGPTs when it comes to maintaining the research originality and writing ethics. (pp. 2)

There have been different concerns that were voiced for the use of ChatGPT outside of the academic world and educational concerns too. For instance, Zhou et al., (2021) stated in their research that running these data algorithms and storage facilities at the scale that OpenAI does consumes a lot of energy which isn't really optimal considering the bigger scale threat that the world faces: global warming.

Nevertheless, responsible use of AI in education is possible too. One can use AI for a variety of purposes in education; first and example could be based on an individual student's learning preferences, areas of strength, and areas of weakness which can be taken into account by AI algorithms to produce individualized lesson plans for that individual students which would make learning process more personalized, thus, more effective. AI can be used to produce educational materials, including tests and quizzes, animations and videos, and graphics. Furthermore, after creating those materials, AI may then be utilized to automatically evaluate homework and exams given by the teacher, saving teachers a noteworthy time and giving students quick feedback. By combining AI's algorithm and analyzing data a student provides, teachers can intervene and offer support before it's too late by analyzing data on student performance, attendance and such to spot early warning signals of academic and behavioral difficulties. Besides, in order to reduce the time needed to write and boost writing quality, AI can be a useful tool as it can spot grammatical and linguistic mistakes, improving the comprehension of written text (Atlas, 2023). Besides these interactions which generally feature student data and student-teacher interaction, AI may also be utilized as an application to develop teachers' AI literacy, which refers to the capacity to comprehend, make use of, and analyze the social implications of AI technologies (Ng et al., 2021; Su et al., 2022). That is to say, AI can be utilized and trained to develop AI literacy of not just teachers but also students which will better prepare them to future and boost their general self-efficacy levels. Next section will discuss AI literacy related issues and teacher self-efficacy.

2.5. Teacher self-efficacy and AI literacy

TSE can be described as the perspectives held by pre-service and in-service teachers regarding their ability to plan and carry out the actions necessary to generate certain teaching necessities in relation to instruction, classroom management, and student engagement. It is believed that TSE views are most versatile in the beginning of a teacher's career, especially during teacher education (Woolfolk and Hoy, 1990; Henson, 2002). Because of this, research on the TSE has been primarily centered on preservice educators and, more particularly, the practicum experiences of those teachers. This is partly due to practicum's reputation as an impactful stage partly it is due to the alleged significance of mastery experiences. Opportunities for vicarious experiences are also present during the practicum. Pre-service teachers have the chance to learn from role models by observing experienced teachers' classes. This is especially advantageous for TSE growth when a number of capable teachers can be observed (Pfitzner-Eden, 2016). For instance, the mentor would be a powerful source of verbal persuasion if the practicum experience is overseen by a mentor teacher at the placement school. The practicum also gives preservice teachers perhaps their first real chance to actually experience a variety of indications like physiological states and emotional states. Such signs are especially important for influencing TSE views if the work environment involves demanding or stressful conditions. Due to this, it is very much possible for the practicum to have a detrimental impact on TSE development because it is seen as a very stressful component of teacher preparation (Klassen & Durksen, 2014). As in line with these findings; the next big thing in education, AI, will test the digital competencies of educators around the globe. ChatGPT is surely going to be around and new powerful AI-driven digital models are being created day by day. Hence, in order to use these tools in ways that are both educationally appropriate and moral, teachers and students must learn the specialized digital skills required which include learning how to use ChatGPT and facilitating educational assignments that take advantage of its features while developing the many literacies that are required during the age of information technologies at the same time. Cote & Milliner (2018) showed that EFL teachers at a Japanese university were confident in using digital technologies to help their teaching, whereas Gómez-Trigueros et al., (2019) reported that the results of their work demonstrated an apparent absence of awareness of specific technological concepts necessary for their future teaching profession, as well as major variances in digital literacies based on the age of the participants. However, due to the necessity of doing online instruction during the COVID-19 pandemic, language teachers have improved their digital literacy (Moorhouse, 2023), but they still require more training to use ChatGPT effectively as it is a very recent and unfamiliar tool for many. Table 1 below presents a summary of the digital literacy requirements for teachers to use ChatGPT.

Technological Proficiency	<ul style="list-style-type: none"> • Be aware of the features of ChatGPT • Understand how ChatGPT works • Construct effective prompts and interact with ChatGPT • Troubleshoot challenges using ChatGPT in the classroom • Stay up-to-date with changes to ChatGPT
Pedagogical Compatibility	<ul style="list-style-type: none"> • Think about and plan ways to use ChatGPT to enhance or transform language teaching and learning tasks • Implement tasks that use ChatGPT • Guide learners to use ChatGPT for self-directed learning

Social Awareness	<ul style="list-style-type: none"> • Have a critical awareness of the drawbacks of ChatGPT and consider them when planning and implementing tasks • Inform learners of the risks, ethical issues, and drawbacks of ChatGPT
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Table 1. Specific Forms of Digital Competence Needed to Use ChatGPT (Kohnke et al, 2023).

As can be observed from Table 1, there are three types of skills educators will need to adapt to. First is technological proficiency which includes broader statements that are related to AI literacy of educators, secondly, pedagogical compatibility of use of AI in class is mentioned. Teachers who wish to use AI and/or ChatGPT in their classes need to consider their educational context as it may not be suitable for all kinds of learners or even institutions as some have reacted strongly against the use of it. For example, due to "concerns regarding the safety and accuracy of the content," the NYC Department of Education prohibited access to ChatGPT on educational devices (Elsen-Rooney, 2023) and institutions in Australia reportedly switched back to traditional exams after learners were discovered using ChatGPT to produce essays during examinations (Cassidy, 2023). It is argued in this article that reactions such as these should not hinder the responsible use of ChatGPT and other AI-driven systems.

3- Conclusion

The present study provided a combined literature review on teacher-self efficacy and AI in education to fill the gap in the literature for relatively new and ever-growing AI and its use in classroom. The article discussed key issues regarding the use of AI in education. Studies reviewed in this paper suggested that self-efficacy is affected by various factors, but as there were no studies found which measured the correlation between AI literacy and teacher self-efficacy beliefs, it can be concluded that future research should be conducted to fulfill this gap. In order to keep up with constantly changing AI systems and tools, both pre-service and in-service training programs should be organized by policy makers as those programs might provide vicarious learning opportunities to both teacher trainees and experienced educators. The programs should make the basis for the information transfer from teacher to students, as they will also need to increase their AI literacy to better prepare for what is up and coming. In this way, it can be stated that we will not only increase the quality of education but also the general self-efficacy beliefs of everyone involved in the education process. However, rather than abusing AI or allowing it to abuse us in the rush to develop academic knowledge and train the next generation of professionals, it is critical to think about how to use this technology responsibly and ethically. In addition, further identifying ways that we can take AI's advantage to improve our work efficiency rather than letting the tool take over and replace our work can be concluded as the most significant outcome of this paper.

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