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Investigating teachers' perceptions of artificial intelligence tools in education: potential and difficulties

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Abstract

This paper investigated teachers' perceptions towards the integration of Artificial Intelligence educational tools (AIED) into their educational practices.Indeed, AI rapidly advances across various fields, including education, and it is essential to understand teachers' perceptions to effectively harness its potential.The study used a quantitative methodology, employing a questionnaire to collect perspectives from 1101 Saudi teachers across different levels and backgrounds. The research attempted to address two research questions focused on (1) The potential of AI as a tool to enhance teaching practice, and (2) the Difficulties encountered by teachers when utilizing AIED tools. The findings showed many teachers acknowledge AIED's potential to save time, assist in designing enriching activities, and personalize learning experiences, however, concerns exist regarding the effort required for training, potential job displacement, a lack of creativity and critical thinking, unintended consequences, and trust in AI's error- free performance. Although teachers have explicit optimism about AIED's benefits, a cautious stance emerges due to concerns about its impact on educational quality, human touch, and potential risks. These results emphasize the need for targeted professional development, collaborative efforts between educators and policymakers, and ethical considerations to ensure responsible and effective integration of AIED. Understanding teachers' perspectives is crucial for informed decision-making and fostering a balanced approach that optimizes AIED's contributions while upholding the principles of effective and inclusive education in the rapidly evolving Saudi educational landscape.

Keywords Artificial intelligence in education · EdTech · Teacher · Computer education

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1 Introduction

Artificial intelligence (AI) has rapidly used in various domains including education. The potential of AI tools show how could be employed in professionals such as Marketing, content creation, legal workers etc. The rapid expansion of AI technology has brought about significant transformations in various aspects of human life, including interactions, communication, lifestyles, learning, and professional activities (Zhang & Aslan, 2021). These advancements have had a profound impact on the field of education, reshaping the practices of teaching and learning. Artificial intelligence seems to have the potential to revolutionize education; providing personalized learning experiences, automating tasks, providing feedback to students, (Moreno-Guerrero et al., 2020). All of which can free up teachers' time to focus on more important things, such as building relationships with students and providing individualized instruction.

There are many studies where they focused on teach- ing (Lampos et al., 2021), learning (Koc´-Januchta et al., 2020) across the world which explains how AI become consider as promising technology in education. AI in Education (AIED) has gained significant importance as a burgeoning research field that shapes the future of learning (Miao et al., 2021), and its impact extends across various aspects of education, including learning, teaching, assessment, and administration. As AIED tools continue to permeate education, it is crucial to understand stakeholders' perceptions of AI as a tool to support their educational practice. One of the important stakeholders is teachers and exploring their perceptions can provide valuable insights into how they perceive and interact with AIED, as well as inform the development of effective strategies for integrating AI into educational practices. So, this paper aims to examine the Saudi teachers perception towered AIED tools. Through this investigation, it can be gained a comprehensive understanding of how teachers per- ceive this emerging technology and its implications for their professional roles as well as the difficulties they encounter within the given context.

1.1 Research question

RQ1 What are the perceptions of Saudi teachers regarding the potential of Artificial Intelligence as a tool to enhance teaching practice?

RQ2 What are the difficulties encountered by Saudi teachers when utilising AIED tools in their educational practice?

2 Literature Review

2.1 AI in education

In recent decades, significant progress has been made in the application of artificial intelligence (AI) to address various challenges in the field of education. Since the 1980s, "AI in education" has been recognized as an established academic research

field. According to Aldeman et al. (2021)markable significant milestones in the field were in 1993 when formed the International AI in Education Society (IAIED) and in 1989 when the first publication of the International Journal of Artificial Intelligence in Education. However, the roots of AI in education can be traced back to the development of Intelligent Tutoring Systems and Computer Assisted Instruction systems in the 1960s and 70s (Perrotta & Selwyn, 2020). This can explain that AI has be adopted in education early. Indeed, AI has been employed in two main ways within the context of education. Firstly, it has been utilized as a learning tool, enabling students to engage in hands-on exploration and experimentation with AI algorithms. Secondly, AI has been leveraged as a technological tool to facilitate the customization of learning environments, tailoring instruction to meet the unique needs and individual goals of learners (Chounta et al., 2022).

In addition, AIED tools used in learning and teaching platforms such as Blackboard and Canvas to improve the students learning experience. For example, Blackboard used Chatbots to provide a natural way for students to interact and engage with platform and to have assistant on the right time. Other example, Canvas using AI to provide insights into students engagement and learning outcomes by using Canvas Analytic. Furthermore, AIED tools used to help the teacher as facilitator by providing him a visualisation of students data (Chounta et al., 2022) which allow the teaches tracking the students and intervene in the right time. AIED can serve as a valuable resource for teachers, enabling them to make well-informed decisions and effectively organize their teaching practices in order to enhance student learning. It seems that the learning platform attempt to utilising the advancement of AI to provide personalised learning based on each students needs.

Indeed, the AI as technology can lead the reviolation in the field of educational technology regards its potential.Studies stated AI in Education holds significant promise for enhancing various aspects of the education ecosystem, including learning, teaching, assessment, and educational administration (Roll & Wylie, 2016). It also empowers teachers by providing them with insights into students' learning processes. These studies showed that the integration of AI in education is driving a transformation in teaching and learning practices and program development. It represents a crucial area for educational research, as it has the potential to reshape traditional educational approaches. Furthermore, within the realm of K-12 education, AI has the potential to serve as a valuable tool for teachers. It can aid in the creation of learning activities and scaffolding strategies, as well as enhance teachers' awareness by offering insights into students' activities and performance (ibid.).

However, research in the field of AI integration in education has highlighted critical concerns regarding its implementation. Luckin (2018) emphasizes the potential threats AI systems pose to human interactions, relationships, learning quality, and the privacy of stakeholders, including teachers and students. The focus on training individual skills at the expense of students' well-being and sense of relatedness has also been raised (Bulger, 2016). Moreover, there are concerns about questionable prioritization of goals and aims within AI systems. Additionally, AI algorithms have the potential to amplify negative stereotypes, social inequities, and unfairness in educational contexts (Holstein et al., 2019). Furthermore, there are some challenges in terms of ethical costs, privacy, scalability, lack of actionable guidelines for teachers

and lack of AI experts among teachers (Zhang & Aslan, 2021). However, there is a need for more research to find out the challenges of using a.i. in education from teachers perspective.

2.2 AI in teacher practise

Teachers play a crucial role in the successful implementation of AI in schools, as they act as intermediaries between schools' AI policies and students' needs (Felix, 2020). Ensuring AI technologies are effectively integrated into educational practices to meet the requirements of students depends on teachers who are at the forefront of AI deployment(ibid.). However, UNESCO published a report stated that the implications of AI in education are still uncertain, and further investigation is necessary to determine the extent to which these emerging technologies can enhance educational practices (Miao et al., 2021). Nevertheless, it is important to understand how AIED can be employed in teachers' practices. Indeed, the previous studies showed that AIED can be utilised by teachers, it can handle certain aspects of teachers' workload, such as grading, administrative tasks, and personalized student guidance, and teachers can redirect their focus towards other critical areas (Zhai, 2022). This includes emphasizing the human aspect of teacher-student relationships and allocating more time to engage in research activities that can enhance their professional reputation, such as securing research grants and publishing in prestigious international journals.

Furthermore, Johnson (2019) stated that AIED can offer several advantages for teachers; Firstly, it simplifies administrative tasks, such as paperwork, making them more efficient. Secondly, AI has the potential to enhance textbooks by providing smart content, making them more understandable and engaging for students. Thirdly, AI enables personalized learning experiences by tailoring tasks and feedback to individual students' needs and preferences. Fourthly, AI facilitates global learning as AI-enabled apps are portable, allowing education to take place anytime and anywhere, accommodating the readiness of the students. Lastly, AI brings new efficiencies by effectively processing and handling large amounts of data. From this point of view, it is evident that AI outperforms humans in specific detailed tasks and navigating vast amounts of factual information.

In addition, a Systemic review carried out by Xia et al. (2022) found that teachers' ability to effectively manage classroom teaching has been enhanced through the combination of computer-assisted instruction and AI in various subject classrooms, such as language education through streamlining the uploading, assigning, and distribution of learning materials and assignments, as well as to provide text-to-speech capabilities for problem- solving. However, this review stated that there is a common challenge arises from teachers' limited understanding of the inner workings of these technologies. Without a comprehensive understanding of how task assignments are generated and the recommendations for teaching strategies, teachers may perceive the technology as a "black box," leading to a sense of reduced control and diminished self- efficacy. Consequently, this lack of confidence may deter teachers from fully embracing AI as a tool to support their classroom teaching. Although This systemic review clarifies how AIED integrates into teacher practice and shows the efficiency

of classroom management for teachers which seems significantly improved, the teachers need to have a comprehensive understanding of how Ai tools can be utilised.

It is predictable that education systems across the world are enthused to utilise AIED tools in their educational practice as educational technology tools. Indeed, Saudi education has invested in integrating recent technology by providing the infrastructure of technology at school and encouraging the teachers to improve their professional development by attending training including EdTech workshops. In addition, it can be observed how users of social media platforms spread the AI tools and have attracted users from different professions which helps to the popularity of AIED tools. The AIED tools could consider as one of the educational technology that is desirable to use. So, it is important to understand teachers' perceptions toward the use of AI tools as educational technology.

One of the example studies attempts to understand teacher perception its carried out by Chounta et al. (2022) the study found that it was observed that a significant proportion of teachers (45% of participants) considered their knowledge of AI to be limited, while 35% described it as basic. However, overall, the teachers exhibited positive attitudes towards the integration of AI in education. They viewed AIED as a valuable tool for tasks such as accessing learning resources, structuring lesson content and schedules, and evaluating student assignments. Nevertheless, the teachers expressed concerns about the negative effects of AI on human interaction and the social aspects of learning. It is worth to mentioned that the AIED tools can be help teacher in their professional development. In addition, a study carried by Gunawan et al. (2021) which focused on teacher professional development. The paper discusses the implementation of a competency enhancement program for science teachers assisted by artificial intelligence (AI) in designing higher-order thinking skills (HOTS)-based integrated science learning. The results of the study showed that the competency enhancement program was effective in improving the science teachers' knowledge and skills in designing HOTS-based integrated science learning. The teachers were able to design more engaging and challenging learning activities that helped students to develop their HOTS skills.

Recently, generative AI tools certainly ChatGPT, and Brad has published for the public which become fastest- growing application in history (Hu, 2023). These tools powered by Large Language Model (LLM) technology, can create content instead of solely analysing existing data. These applications often take the form of AI chatbots, where users input a prompt, and the system generates real- time content as a response to the given prompt. These tools can be used by teachers in terms of designing and organising course materials, personal content, design classroom activities. For example, ChatGPT can been used for teaching preparation including generating course materials and providing suggestions (Megahed et al., 2023), also used to creating an assessment including generating assessment tasks and evaluating student performance (Han et al., 2023). It can assume that the potential for these tools can providing teachers with more time to focus on other aspects of teaching. Furthermore, the possible usage of generative AI encourages the teacher to consider the value of AI tools around them. AI tools can assist teachers in identifying relevant learning resources, curating educational content, and designing instructional pathways that align with specific learning goals.

It seems that by utilizing AI in educational practice, teachers can gain valuable support in aligning their instructional practices with learning goals, ensuring that their teaching approaches are focused on fostering student growth and achievement. The integration of AI technologies can enhance the effectiveness and efficiency of teaching, ultimately benefiting both teachers and students in their educational journey. However, generative AI tools can cause issues that affect negatively educational practice. Such as It can be inaccurate outcomes relying on biased data (Tlili et al., 2023), it also could depend on not up-to-date information knowledge (Perkins, 2023), or generating incorrect or fake information.

Overall, the AIED tools exhibit both advantages and concerns, emphasizing the need to investigate them from various perspectives, including technological, pedagogical, and educational aspects. Furthermore, considering the crucial role that teachers play in utilizing educational technology tools, it is essential to explore their perceptions of AI as a tool in educational practice. By gaining insights into teachers' perspectives, we can better comprehend the potential and concerns surrounding AIED, enabling us to develop strategies that ensure the integration of AI aligns with the principles of effective and inclusive education. Therefore, this study aims to examine the perceptions of Saudi school teachers towards AIED, taking into account the rapidly evolving educational landscape in the Middle East.

2.3 Methodology

The paper aimed to comprehend teachers' perspectives ts regarding the utilization of Artificial Intelligence (AI) tools to enhance their educational practices. The used methodol- ogy is quantitative, designed to address the research ques- tions effectively. The researcher opted for a questionnaire method enabling the collection of diverse perspectives from a substantial number of teachers. This method enabled the researcher to find out the teachers' perceptions regarding the possibilities and obstacles associated with integrating Artificial Intelligence into the realm of education.

2.4 Questionnaire

The Questionnaire aimed to explore the Saudi teachers' perceptions and familiarity regarding AI and its use in the educational context. The design of the questionnaire was closed-ended that contains four sections. The first section explores the overview of respondents including their gender, specialization, level of education, years of experience and type of school private or public. The second section attempted to measure teacher familiarity by asking them about their knowledge of AI and if they have ever experienced it in their job. The third section aimed to explore teachers' perception of the potential of the use of AI to help them in their educational practices by rating their level of agreement on a 5-point Likert scale. Items of this section cover some potential of using AIED that are mentioned in the literature; saving time for teaching tasks including creating lesson plans – providing educational content and resources – reviewing homework (items1,item2,item3) – designing educational activities including enriching activities and differentiated activities (item4-item6) – creating assessments (item5) – personalised learning (item7)- tracking students'

progress to assess their needs(item8)- providing an interactive learning experience for students (item9).

Section fourth aimed to find out the teacher perceived difficulties of using AIED in an educational context by rating their level of agreement on a 5-point Likert scale. The teachers were asked if they believed AIED requires effort to learn(item1), if they emotionally feel that AI might threaten to lose someone's job(item2), the difficulty to trust AI to do tasks without error(item3), the difficulty of depending on AIED (item4), the lack of training (item5), personalised attention (item6), negative effect on creativity and critical thinking among teacher and student (item7 and 9), the unintended consequences of use AIED.

In addition, the teachers were asked "What areas of your work could be supported by AI?" to explore their perceive AI in education. Finally, the teachers were asked "What kind of support or training do you think you need in order to use AI effectively in your teaching practises?" to understand their needs to adopt AIED.

2.5 Overview of the sample

The following is an overview of the participants of this study which were 1101 Saudi teachers from different cities. The Table 1 below shows gender distribution and it was 561 Male and 540 Female. Furthermore, it can be observed that 46% of the participants teach at primary schools, 29% in high schools, 21% at elementary schools and just 3% at the early childhood level. In addition, the educational level offers insight into the educational background of participants. Most of the participants hold Bachelor's degrees around 83% and 12% hold Master, 2% PhD and also 2% hold a diploma. In terms of their teaching experience, it shows that most of the partici-

Table 1 An overview of the participants

	Percentage %	Count
Gender		
Female	49.0%	540
Male	51.0%	561
Early Childhood	3.3%	36
What grades do you teach in school?		
Elementary School	21.0%	231
High School	29.4%	324
Primary School	46.3%	510
Bachelor	83.1%	915
Educational Levels		
Master	12.0%	132
PhD	2.7%	30
Diploma	2.2%	24
Teaching Experience		
0–5	24.3%	267
11–15	36.8%	405
6–10	37.6%	414
+16	1.4%	15

pants were between 6 and 10 years (37%) and 11–15(36%) and over 16 years just 5 teachers.

3 Result and discussion

The objective of the paper was to gain insight into Saudi teachers' perceptions about the integration of Artificial Intelligence in Education (AIED) within their teaching practices. The research questions aim to explore teachers' perspectives regarding the potential benefits and challenges associated with AIED. At the initiation of the survey, teachers were asked about their prior exposure to Artificial Intelligence in Education (AIED) to gauge their level of familiarity with the concept of AIED. The results of the first question (see Fig. 1) indicate that approximately 64% of teachers reported utilizing AIED, with 25% confirming their usage and 10% indicating unfamiliarity with AI. These findings demonstrate that AIED has not yet been adopted by all teachers, indicating the presence of a subset that is still less acquainted with this technology.

The result of the second question (see Fig. 2) shows that the majority of teachers who participated in this study stated that they have limited knowledge (40%). 2.2% of the teachers reported that they are experts in AIED 2% and 18% of the teachers have a lot of Knowledge. Teachers who have never heard about AIED (7%). This result suggests that AI in education is still a relatively new concept for Saudi teachers, and it could be because this concept is rapidly evolving in the field. In addition, the

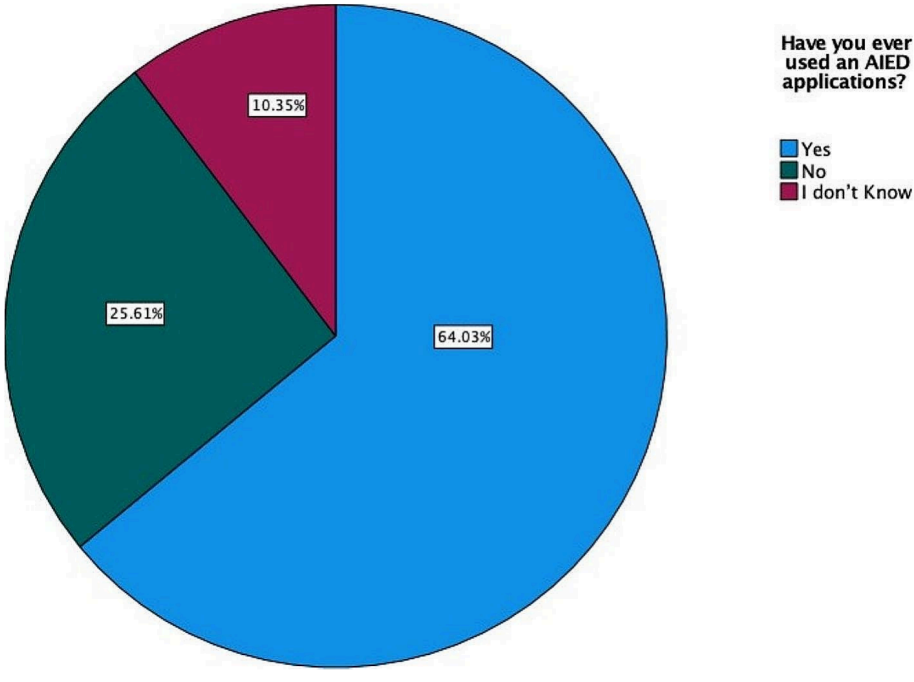

Fig. 1 Have you ever used AIED applications?

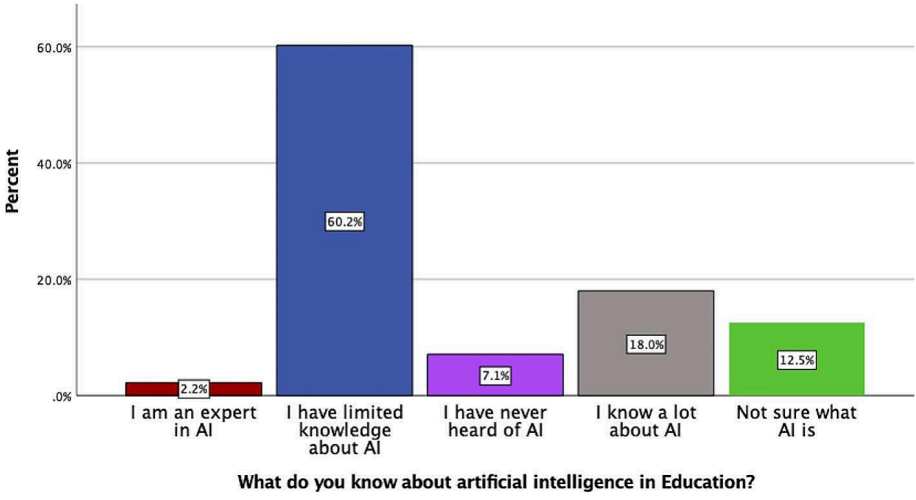

Fig. 2 The level of Teachers Knowledge about AIED

Table 2 Save Time

Items	Agreements Level	Count	*N* %
AI applications could help me to save when creating a study plan for my lesson	Strongly Disagree	300	27.2%
	Disagree	15	1.4%
	Neutral	84	7.6%
	Agree	696	63.2%
	Strongly Agree	2	0.5%
AI-applications could help me to save time when looking for materials/content for my lesson	Strongly Disagree	264	24.0%
	Disagree	6	0.5%
	Neutral	102	9.3%
	Agree	723	65.7%
	Strongly Agree	6	0.5%
AI-applications could help me to save time when reviewing homework	Strongly Disagree	282	25.6%
	Disagree	15	1.4%
	Neutral	144	13.1%
	Agree	654	59.4%
	Strongly Agree	6	0.5%

result indicates that there is a knowledge gap about the AIED concept, which could pose challenges for teachers to the adoption of AI in education.

3.1 RQs1: potential of AIED

In this section, the aim was to discuss the teachers' responses regarding their perception of the potential of Artificial Intelligence in Education (AIED). Table 2 presents the findings demonstrating that majority of teachers agreed that AIED has the potential to save time and reduce the workload associated with their educational practices. Specifically, 63.2% of teachers who participated in this study believed that AIED could assist in saving time when creating study plans. Furthermore, the percentage

of teachers how expressed the view that AIED could provide educational content and resources while also saving time was 65.7%. Furthermore, 59.4% of teachers identified the potential of AIED in reducing the time spent on reviewing homework. These results explain how AIED tools can reduce time-consuming tasks for teachers. Indeed, previous studies (Baidoo-Anu & Ansah, 2023; Felix, 2020; Kizilcec, 2023; Zhai, 2022) have supported these findings by highlighting the various ways in which AIED can assist teachers. The report published by Macksny found that teachers spend an average of 11 h a week in preparation activities, the advantages of the use of technology could reduce the time to just six hours approximately and could also make that time more efficient, helping the teachers to create even better lesson plans and approaches. Current study found that AIED has the potential to reduce time-consuming tasks and this can be an encouragement for teachers to utilise AIED in their practices. AIED can effectively help with certain aspects of teachers' workload, such as grading, administrative tasks, and personalized student guidance, enabling teachers to redirect their focus to other critical areas. However, the result also showed that a notable percentage of the teachers expressed disagreement with the aforesaid points. This could be attributed to the fact that these teachers may not have had prior experience with AIED, thus lacking familiarity with its potential benefits. Other reasons could be that they have some reticence about relying on AIED tools for these tasks and have concerns about the accuracy and educational value of depending on this technology for their educational.

practices.

The survey also attempts to find out teacher perception regarding how the AIED assist them in design educational activities. The finding reveal that majority of respondents (63.9% and 60.1% respectively) agree that AIED applications can assist in designing enriching activities for students and activities that are suitable for different student levels (see Table 3). This result demonstrates the distinguishing of the potential benefits of incorporating AIED in teachers' prac- tices in terms of designing and providing valuable learning activities for students. In addition, the data also indicates that a considerable number of respondents (66.2%) agree that AI applications

Table 3 Design educational activities

		N %	Count
AI-applications could help me to design enriching activities for students.	Strongly Disagree	25.1%	277
	Disagree	1.1%	13
	Neutral	9.3%	103
	Agree	63.9%	702
	Strongly Agree	0.5%	6
AI-applications can help me design activities that are suitable for different student levels.	Strongly Disagree	24.6%	271
	Disagree	1.6%	19
	Neutral	13.1%	145
	Agree	60.1%	660
	Strongly Agree	0.5%	6
AI-applications can assist in personalizing learning for each student	Strongly Disagree	9.5%	105
	Disagree	2.7%	30
	Neutral	15.3%	168
	Agree	66.2%	729
	Strongly Agree	6.3%	69

can assist in personalizing learning for each student. This finding is promising, as personalised learning has been shown to improve student engagement and learning outcomes (Yang & Ogata, 2023).

Indeed, It observes that a substantial number of teachers believe that AIED applications can contribute to designing enriching activities for students. This aligns with studies that claimed that AIED could offer personalized and adaptive learning experiences, taking into account the strengths, weaknesses, and interests of each individual student (Dalvean & Enkhbayar, 2018). By leveraging AIED, teachers can create activities that cater to students' specific needs and preferences, enhancing engagement and motivation. One could argue that AIED could assist teachers to meet the rising interest in personalized learning. The AIED tools can analyse and process students' data to determine students' skill levels and provide interventions. This can help address the challenge of accommodating diverse abilities and learning paces within a single classroom, ultimately promoting more effective learning outcomes. A systemic review by Celik et al. (2022) states that AIED helps teachers identify their students' needs so they can choose the most appropriate learning content and activities. An example of using AIED can be the analysis of the data of students to enable teachers to track students' progress and the differences in their levels, then the teachers could use this information to feed generative artificial intelligence such as ChatGPT to suggest appropriate activities for the students.

However, it is worth noting that there is a considerable percentage of teachers who are either neutral or disagree with what mentioned above. The reasons could include a lack of familiarity with AIED applications in their practices and concerns about the reliability and accuracy of AIED. In fact, these concerns should be addressed and teachers should be provided with adequate training and support to effectively employ AIED tools. This may help increase acceptance and understanding of the benefits this technology can offer. One of the suggestions mentioned in the 2018 Horizon report was the need for re-evaluating educators' stances, as their attitudes towards AI significantly influence its implementation in education (Becker et al., 2018). To avoid extremes of resistance or excessive reliance, teachers should prioritize updated and relevant professional development, understanding that AI serves as a tool rather than a replacement for them(ibid.).

In addition, the Table 4 below shows the results that indicate that a majority of participants agree that AI-powered learning tools can help create engaging and interactive learning experiences(61.7%). This finding suggests that teachers identify the potential of AIED to enhance the learning process by making it more dynamic and interactive. The AIED technology offers teachers valuable tools such as customised content, assign tasks and automated assessments etc., which assist teachers in providing interactive learning experiences for students. In addition, the finding shows that a 61.7% of respondents that AI applications can assist in designing assessment questions. This result highlights the potential of AI in automating the assessment process, making it more efficient and effective. Gardner et al. (2021) argues that AI has the potential to revolutionize educational assessment by making it more personalized, efficient, and accurate. It assumes that teachers could leverage AI to generate a wide range of assessment questions designed for specific learning objectives or individual student needs.

Table 4 Potential of AI-powered learning tools

		N %	Count
AI-powered learning tools can help me to create engaging and interactive learning experiences.	Strongly Disagree	24.6%	271
	Disagree	1.1%	13
	Neutral	12.0%	132
	Agree	61.7%	679
	Strongly Agree	0.5%	6
AI-applications can help me design assessment questions.	Strongly Disagree	26.2%	290
	Disagree	1.1%	14
	Neutral	10.4%	110
	Agree	61.7%	680
	Strongly Agree	0.5%	7
AI-powered learning tools can help me to track student progress and identify areas of need.	Strongly Disagree	27.3%	302
	Disagree	1.6%	19
	Neutral	12.6%	136
	Agree	57.4%	631
	Strongly Agree	1.1%	13

Furthermore, a majority of teachers (57.4%) showed agreement that AI-powered learning tools can help track student progress and identify areas of need. The result stresses the potential of AI in supporting formative assessment practices. The teachers can gain valuable insights into students' learning progress, identify areas where students may be struggling, and intervene in a timely manner to provide targeted support by for example automating data collection and analysis. Indeed, AI enables the analysis of extensive data to detect patterns and trends in student performance, informing curriculum design, teaching strategies, and interventions. However, while there is a significant agreement among the particpants, it is worth noting that a substantial percentage of teachers expressed neutrality or disagreement in some statements. This suggests that there may still be hesitations or concerns regarding the integration of AI-powered learning tools in terms of assessment and providing interactive learning experience.

Overall, the findings show a positive attitude of teachers towards the use of AIED to save time in various aspects of lesson planning and teaching and in designing enriching activities and activities suitable for different student levels. Although there are also notable percentages of disagreement and neutral responses, the majority of respondents agreed or strongly agreed that AIED can be beneficial. Indeed, these result algin with studies that consider how AI could assist teachers which argue the potential of AI to revolutionize education by automating many of the tasks that teachers currently perform, such as grading papers, providing feedback, and creating lesson plans. AI can also be used to personalize learning, provide real-time feedback, and create engaging and interactive learning experiences. (e.g. (Bryant et al., 2020). However, It is important to consider teacher preferences, concerns, and the context individually when implementing AIED tools in the educational environment, ensuring that they complement and promote existing teaching practices rather than thought replace them entirely.

3.2 RQs2 difficulties of AIED

The second research question was focused to investigate the difficulties of using AIED that prose teachers. To address this question the section section in the survey was asked the teachers about the challenges and difficulties of using AIED.

First of all, finding shows that opinions of teachers were variety regarding the effort required to learn how to use AI- powered learning tools (see Table 5). 42.2% of teachers agree that it required effort and 7.6% strongly agree. The findings also highlight the difficulty for teachers to have time and training in effectively using AI-powered learning tools. A majority of respondents (52.0%) agreed that teachers may not have the necessary time or training, with 3.0% strongly agreeing. These findings indicate that the lack of adequate training and potential time constraints could be difficulties for teachers in utilizing AI-powered learning tools. Indeed, the teachers could have an overload of responsibility which could affect the growth of their professional development. At this point, there is a need the policymakers to encourage teachers to invest in their professional development by providing them with developed training that also focuses on AIED.

These results have implications for the implementation of AIED tools among teachers. Although several teachers perceive the effort required to learn how to use AIED tools, it is important to address their difficulty with time and training. It could be achieved by providing comprehensive training programs and ongoing support for teachers to overcome and alleviate these issue and enable them to effectively integrate AIED tools into their teaching practices. In addition, there is a need for further research to be conducted to identify the areas where teachers may require additional training and to develop training programs to improve their use of AIED tools in teaching practices.

Furthermore, the finding appears a divided viewpoint regarding the use of AIED and its potential effect on creativity and critical thinking skills, both among students and teachers. A significant percentage of teachers agree that AI may lead to a decrease in these skills (38.1% for students and 33.4% for teachers as shown in the Table 6 below). This view could argue that the use of AI in education often includes such as standardized assessments, personalized learning algorithms, and automated grading systems. Indeed, these tools, although efficient and time- saving, may limit teachers' and students' opportunities for creative problem-solving and deep critical thinking.

Table 5 Difficulties of AIED

		Count	Column *N* %
It would require effort to learn how to use it	Strongly Disagree	174	15.8%
	Disagree	72	6.5%
	Neutral	306	27.8%
	Agree	465	42.2%
	Strongly Agree	84	7.6%
Teachers may not have the time or training to effectively use AI-powered learning tools.	Strongly Disagree	144	13.1%
	Disagree	78	7.1%
	Neutral	273	24.8%
	Agree	573	52.0%
	Strongly Agree	33	3.0%

Table 6 Difficulties of AIED

		Count	Column *N* %
The use of AI in education may lead to a decrease in creativity and critical thinking skills am…	Strongly Disagree	354	32.2%
	Disagree	60	5.4%
	Neutral	243	22.1%
	Agree	420	38.1%
	Strongly Agree	24	2.2%
The use of AI in education may lead to a decrease in creativity and critical thinking skills …	Strongly Disagree	392	35.6%
	Disagree	61	5.5%
	Neutral	238	21.6%
	Agree	367	33.4%
	Strongly Agree	43	3.8%

Table 7 Difficulties of AIED

		Count	Column *N* %
I'm scared it could take someone else's job	Strongly Disagree	390	35.4%
	Disagree	84	7.6%
	Neutral	207	18.8%
	Agree	414	37.6%
	Strongly Agree	6	0.5%
The use of AI in education may have unintended consequences that are not yet known.	Strongly Disagree	117	10.6%
	Disagree	30	2.7%
	Neutral	159	14.4%
	Agree	693	62.9%
	Strongly Agree	102	9.3%

Students and teachers may become overly reliant on these systems when educational experiences are guided by AI algorithms and predefined frameworks. This could lead to a decline in creative thought and innovative approaches.

On the other hand, those who disagree with the idea that AI negatively affects creativity and critical thinking may assert that AI can actually enhance these skills. They might assume that AIED tools have the ability to provide students with personalized feedback, adaptive learning experiences, and easy and fast access to vast amounts of information which promotes autonomous exploration and creativity. This view is consistent with a study carried out by (Wang et al., 2023) who found the positive effect of using AI on students' creativity skills also their performance. Furthermore, AI can automate teachers' routine tasks which allows them to focus more on higher-order thinking activities and provide attention to students individually.

The teachers were asked about their perspectives regarding the fear of job displacement due to the use of artificial intelligence (AI) in education. The Table 7 shows that the percentage of respondents who hold concerns about AI taking someone else's job was 37.6% agreeing and 35.4% strongly disagreeing and 7.6% disagreeing. It seems not all teachers concern about AI replacing their job. However, the fear of AI could replace human jobs is considered a topic of ongoing debate and research in various industries, including education. The World Economic Forum published a report about the future of jobs and it is estimated that about 85 million new jobs will replace by AI

in 2025 (Miró-Pérez, 2020). Also, this report mentioned that AI could offer around 97 million new jobs. It is worth noticing that this estimation was before the revolution of ChatGPT which could affect the number. Although AIED has the potential to enhance and revolutionize education in numerous ways, there are valid concerns about its impact on teachers' jobs.

Nevertheless, it can argue the implementation of AIED does not necessarily attend complete job replacement. The previous studies argue that AIED can be utilised to improve teachers' capabilities, improve educational practices and make their job easier rather than completely replacing human teachers or other educational professionals (Bryant et al., 2020). An example of that, when teachers used AIED which can assist them with administrative tasks, provide personalized learning experiences, and offer intelligent tutoring, so, these applications can potentially free up teachers' time enabling them to focus on more creative and interactive aspects of teaching. However, the teachers' perceptions indicate a mix of concerns and optimism. The perception of AI's impact on employment can vary depending on technological awareness, job security, and teachers' experiences.

Moreover, the teachers were asked if the use of AI in education may have unintended consequences that are not yet known. Here, the finding demonstrates a slightly different pattern. A smaller number of respondents 10.6%, strongly disagree, whereas the majority agree 62%. This variation might suggest that teachers are more cautious when considering the potential unintended consequences of AI in education. Indeed, AI has the capacity to improve educational outcomes and facilitate personalized learning, however, there are concerns about issues such as data privacy, algorithmic biases, and the ethical implications of relying heavily on AI systems in educational settings (Xia et al., 2022). There is a need for collaboration between educators, policymakers, and technology developers to carry out research which can help address these concerns and pave the way for responsible and beneficial integration of AI in education.

Table 8 Difficulties of AIED

		Count	*N* %
I don't trust AI to carry out tasks without error	Strongly Disagree	444	40.3%
	Disagree	84	7.6%
	Neutral	303	27.5%
	Agree	252	22.9%
	Strongly Agree	18	1.6%
The profession of a teacher requires human intervention and I don't think that artificial intelligence can do what is required.	Strongly Disagree	183	16.6%
	Disagree	66	6.0%
	Neutral	285	25.9%
	Agree	543	49.3%
	Strongly Agree	24	2.2%
AI-powered learning tools may not be able to provide the same level of personalized attention as a human teacher.	Strongly Disagree	360	32.7%
	Disagree	54	4.9%
	Neutral	231	21.0%
	Agree	447	40.6%
	Strongly Agree	9	0.8%

In addition, the teacher was asked about their agreement if they trust AI to carry out tasks without error. The finding (see Table 8) showed that the majority of participants disagree with that, (40.3%) strongly disagree and (7.6%) disagree, which indicates trust in AI's ability to perform tasks without error. Additionally, 27.5% of participants are neutral, 22.9% of them agree, and only 1.6% strongly agree. Thus, the findings suggest that the teachers of the surveyed participants trust AI to perform tasks accurately, although there is some degree of uncertainty among a minority of them. However, the level of trust in AI's error-free performance may vary depending on the specific tasks in question. Different applications of AI in education may have different levels of reliability, which could influence respondents' opinions. Further investigation into the specific tasks and contexts would be necessary to gain a deeper understanding of the reasons behind these responses.

Furthermore, the majority of teachers' response was in agreement level (49.3% agree, 2.2% strongly agree) that the profession of a teacher requires human intervention and I don't think that artificial intelligence can do what is required. Moreover, 16.6% strongly disagree, and 6.0% disagree(see Table 8 below). These results bring to light the teachers' belief that the complex nature of teaching is difficult to be adequately addressed by AI alone. Indeed, this aligns with the perception that teaching involves not only imparting knowledge but also fostering social and emotional development, personalized support, and adaptability to individual student needs. Literature highlights many features that characterise expert teachers, which include extensive pedagogical content knowledge, better problem-solving strategies, and better adaptation to diverse learners, better decision-making, better perception of classroom events, greater sensitivity to context, and greater respect for students (Guerriero, 2013). It clears that teachers seem to show concerns about AI's limited ability to offer the human touch, empathy, and nuanced understanding that teachers bring to the educational experience. However, it is important to note that AI can still play a valuable role as a supportive tool in education, complementing the work of teachers rather than replacing them entirely.

Moving to personalized attention, 40.6% of respondents agree that AI-powered learning tools may not be able to provide the same level of personalized attention as a human teacher. On the other hand, 32.7% strongly disagree, 4.9% disagree, and 21.0% are neutral. These findings show a divided perspective on AI's ability to deliver personalized educational experiences. The majority of respondents who either disagreed or strongly disagreed with the statement suggest a certain level of uncertainty towards the efficacy of AI in providing personalized attention. These teachers seem to be concerned about the limitations of AI algorithms in understanding comprehensively the unique needs, emotions, and learning styles of each student. Indeed, It is substantial to recognize that AI-powered tools, as advanced as they may be, are built upon algorithms and lack the empathetic, emotional intelligence that human teachers have.

4 Conclusion

In the rapidly evolving landscape of educational technology, the utilising of Artificial Intelligence (AI) tools has increased attention to its potential to transform teaching practices and enhance learning outcomes. This study aims to delve into Saudi teachers' perceptions towards the utilization of AI tools in their educational practices. the examination of teachers' viewpoints enabled this paper to gain valuable insights into the potential benefits and challenges associated with the implementation of AI in education.

The findings revealed a nuanced perspective among Saudi teachers regarding the potential of AI in education. Although, the majority of respondents recognized the potential of AI-powered tools to save time and streamline tasks in various aspects of teaching, there were also concerns about the effort required to learn and adapt AIED tools. Teachers emphasized the importance of training and support to effectively integrate AI tools into their pedagogical strategies. The study illuminated the potential of AI to facilitate the design of enriching and interactive learning experiences, personalized instruction, and efficient assessment processes. However, concerns were raised about the possible implications for creativity and critical thinking skills, as well as the fear of job displacement. Furthermore, the study revealed the need for addressing the potential unintended consequences of AI in education, such as data privacy, algorithmic biases, and ethical considerations. It is imperative for educators, policymakers, and technology developers to collaborate in order to mitigate these concerns and ensure responsible AI integration. While AI holds promise in revolutionizing education, it is evident from the teachers' perspectives that human expertise and the emotional nuances of teaching cannot be fully replaced by technology. Rather, AI should be viewed as a supportive tool that complements and enhances teachers' abilities. This study underscores the significance of continuous professional development and ongoing research to inform the effective and ethical integration of AI tools in the ever- evolving field of education.

In conclusion, this research sheds light on Saudi teachers' perceptions of AI tools in education, providing valuable insights for educational institutions, policymakers, and researchers to navigate the evolving landscape of AI integration in education. As AI continues to reshape educational practices, a harmonious integration that values both techno- logical advancements and the unique contributions of human educators will pave the way for a more effective and inclusive education system.

4.1 The direction of Future Research

This paper recommended future studies to attempt conduct- ing longitudinal studies which is essential to track evolving perceptions of teachers towards AI tools in education. By observing changes over time, insights into acceptance and adaptation can be gained. In addition, comparative studies across regions, educational levels, and subjects can iden- tify variations in attitudes, aiding targeted AI integration strategies. this paper was quantitative and clarified there is a need for qualitative research through interviews and focus groups to complement quantitative data, revealing nuanced motivations and concerns. Furthermore, exploring student viewpoints pro-

vides a holistic understanding of AI's educational impact, aligning expectations with teachers.

Data availability The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Consent for publication Individuals included in this study gave informed consent for the publication of the data involved.

Competing interests The authors declare that they have no competing interests.

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