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RESEARCH

# Perspectives of Teachers on the Employ of Educational Artificial Intelligence Tools in Education: The Case of the Gaza Strip, Palestine

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**Abstract**
This study is aimed at investigating teachers' perspectives on the use of EAITs in education. This study uses a mixed-method cross-sectional design, including a quantitative study and a qualitative study, targeting Palestinian teachers in the academic year 2022–2023. In the quantitative section, we recruited a convenience sample of 264 teachers from schools from November 20, 2022, to June 30, 2023. We gathered data by using an online, well-structured, and self-administered survey with 35 items. The survey tool was composed of seven sections: (A) demographic information, (B) constructivist pedagogical beliefs (CPB), (C) transmissive pedagogical beliefs (TPB), (D) perceived trust (PT), (E) perceived usefulness (PU), (F) perceived ease of use (PEU), and (G) behavioral intention (BI). In the qualitative section, 15 teachers were interviewed in focus group discussions by two trained researchers. Descriptive statistics and an inductive content analysis approach were used to analyze quantitative and qualitative data, respectively. The results showed that the median value of the total CPB scores was very high (4.40, IQR = 4.2–4.8) and TPB was low (2.40, IQR = 2.00–3.05). In addition, the median value of the total PT (3.50, IQR = 3.00–4.00), PU (4.00, IQR = 3.75–4.5), PEU (3.50, IQR = 3.00–4.00), and BI (4.00, IQR = 3.67–4.33) scores was high. Males had a significantly higher median score of PT when compared to females (4.00 versus 3.50, respectively; $p = 0.033$). Teachers aged 22–30 were the highest in the median score of PT as compared to their other counterparts (3.75; $p = 0.037$). Also, teachers who employ technology in education and those who attend courses related to AI in education had a significantly higher median score of PT, PU, PEU, and BI than teachers who did not employ various technologies in education. Also, teachers who work in private schools had the highest median score of PEU as compared to their counterparts (4.00; $p = 0.014$). Teachers who have scientific backgrounds had a significantly higher median score of BI than teachers who have art backgrounds (4.00 versus 3.99, respectively; $p = 0.009$). More detailed research is needed on the impact of employing EAITs on school students and teachers in education.

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**Keywords** Educational artificial intelligence tools (EAITs) · Constructivist pedagogical beliefs · Transmissive pedagogical beliefs · Perceived trust · Perceived usefulness · Perceived ease of use · Behavioral intention

## Introduction

Artificial intelligence (AI) technology development has accelerated due to recent improvements in processing power. The development of machine learning algorithms has produced more sophisticated AI, revolutionizing our lives by enhancing the effectiveness of numerous operations. Particularly, the development of educational AI has been influenced by the rise in demand for education and the adoption of particular national policies (Song & Wang, 2020). A variety of educational AI tools (EAIT) have been created and are being used in education to support teachers and students. For instance, Jeon (2022) showed how an AI chatbot may be used to help language acquisition. Also, one of the most popular types of EAIT, intelligent tutoring systems (ITS), offers customized and automatic feedback (Holstein et al., 2018). The deployment of EAITs has opened the door for new interactions and altered the status of the teacher-student relationship (Guilherme, 2019).

It was reported that cooperation between humans and AI can make decisions that produce better results than those produced by either humans or AI alone (Zhang et al., 2020). The EAIT functions as an agent that can intelligently support teachers in taking better educational decisions or actions for their students when there is teacher-EAIT interaction. It can assess students' cognitive skills (Troussas et al., 2020) and learning styles (Wei et al., 2018), evaluate academic achievement (Riestra-Gonzalez et al., 2021), and assist individualized learning according to their educational level (Piech et al., 2015). There are many advantages that can be realized when teachers cooperate with EAITs. Teachers can make a comparison between their choices and those made using EAIT resources. This supports teachers' judgment, which can help students become better learners. Furthermore, Holstein et al. (2018) demonstrated that when teachers and AI successfully partnered, student learning improved. To help teachers have an objective perspective on their students, an EAIT can provide materials based on certain traits and remove irrelevant aspects (Qin et al., 2020). The EAIT can also minimize the mental workload for teachers, which helps them provide quick support to their students at the required time.

However, it was reported that the lack of technological knowledge among teachers (Chiu & Chai, 2020) and technical infrastructure in schools (McCarthy et al., 2016) are considered the two main obstacles to integrating AI into education. Furthermore, Song and Wang (2020) emphasized the critical need for a thorough understanding of the interactions between humans and computers in a learning environment. Numerous studies have confirmed that the effective adoption of devices depends on user acceptance of technology. Since AI has a lot to offer, users need to be open to accepting and making appropriate use of this technology. Low acceptance could lead to a decrease in the uptake of AI by users, which could cause resource waste, an overabundance of AI gadgets, and a possible decline in technical progress (Kelly et al., 2022). Consequently, it is crucial to identify the factors that encourage or discourage teachers from integrating EAIT into education.

## Statement of the Problem

The integration of EAITs into educational settings has the potential to transform the teaching and learning process, offering innovative opportunities for personalized instruction and enhanced educational outcomes. However, the successful implementation of EAITs in education depends on various factors, one of the most critical being the perspectives of teachers, who play a central role in the adoption and utilization of these technologies.

The problem under investigation pertains to the perspectives of teachers in the Gaza Strip regarding the employment of EAITs in their classrooms. While AI technologies have gained recognition globally, it is essential to understand how teachers in this specific region perceive and interact with AI tools, given the unique educational, socio-economic, and cultural context of the Gaza Strip. Understanding the unique perceptions of teachers in the Gaza Strip on the use of EAITs is essential for tailoring educational technology initiatives to the local context, addressing potential barriers, and maximizing the benefits of AI-driven education, ultimately contributing to more effective and culturally relevant technology integration in the educational system in Palestine.

In Palestine, the studies related to using AI in education are very limited and focused on the effectiveness of AI in developing the skills of students (Al Shobaki et al., 2023; Al-Safadi et al., 2023) and improving higher education outcomes (Atieh et al., 2023). To the best of the authors' knowledge, no previous studies have been conducted on the use of EATIs in education or focused on the perspective of teachers toward EAITs in Palestine. Therefore, there is an urgent need for such research to enrich the literature reviews concerning AI in education in the context of Palestine. Also, this study will be a backbone for other researchers who are interested in the integration of modern technological tools into education by suggesting educational policies that aim to develop and improve the performance of teachers in the light of the AI era.

## Objectives of the Study and Research Questions

The present study aims to investigate teachers' perceptions of accepting EAITs. To achieve the research objective, three specific research questions are formulated as follows.

1. What is the effect of CPB, TPB, PT, PU, PEU, and BI on incorporating EAITs in education?
2. What are the general opinions of teachers toward incorporating EAITs in education?

## Contribution to the Literature

This study adds to the limited literature about the perspectives of Palestinian teachers toward EAITs in education

Since this study focuses on teachers, it can bridge the gap in the literature by providing insights into the perspectives of Palestinian teachers toward incorporating EAITs in education. Improvements to teaching practices in light of EAITs can be made to meet the needs of teachers by understanding the impact of incorporating EAITs in education and its impact on teachers' technological skills

Collecting data on teachers' perspectives helps responsible authorities make decisions that improve the awareness and knowledge of teachers toward EAITs and empower them to incorporate EAITs in education in the future

## Literature Review

### Definition of Artificial Intelligence

There are two key reasons why it can be challenging to define AI, even for subject-matter experts. One thing about AI is that it is always changing. According to Nick Bostrom, a number of cutting-edge AI technologies are integrated into general applications but are not referred to as AI (Bostrom, 2006). Furthermore, the field of AI is interdisciplinary in nature, attracting academics and specialists from other fields like neurology, psychology, and languages who continuously contribute their unique perspectives, expertise, and lexicon. Several researchers have tried to define AI. For example, Russell and Norvig (2016) stated that AI was used to characterize machines or computers that mimicked "cognitive" processes, such as "learning" and "problem solving," which are connected to the human mind. According to Kaplan and Haenlein (2019), AI is the ability of a system to analyze, learn, and apply the information it receives in order to accomplish specific objectives. Also, Poole et al. (1998) reported that AI is the study of intelligent agents that can recognize their environment and maximize the probability of achieving a specific objective. Also, Baker et al. (2019) defined AI as "computers that perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving."

### Artificial Intelligence Tools in Education

In recent years, AI has become increasingly prevalent in the education sector. Different kinds of EAIT have been developed and used to support teachers in educational environments, such as AI chatbots, intelligent tutoring systems (ITS), smart content, automated grading, and personalized feedback (Ahmad et al., 2021). AI tools in education can help students and teachers in a variety of ways, from helping to customize learning experiences to streamlining administrative tasks. Recent research studies have shown that AI tools can be successfully used in education to improve student outcomes. A study conducted by Alam (2022) concluded that AI-based tutoring systems can provide students with more personalized instruction and help them better understand the course material. The study found that AI tutoring systems had a positive impact on student engagement and learning outcomes. In addition, a study conducted by Zawacki-Richter et al. (2019) found that AI-based tools can be used to identify at-risk students and provide personalized interventions to help them succeed in their studies. The study concluded that AI-based tools can be used to provide targeted interventions and improve student performance.

### The Reality of Educational Artificial Intelligence Tools in Palestine

The COVID-19 pandemic has given teachers experience in improving their skills in employing technology in education, as the majority of them have developed their skills in integrating modern technology into classrooms. This transition encouraged decision-makers in the education sector to rely on the accumulated experiences that teachers have acquired during the COVID-19 pandemic and employ those experiences to accelerate the integration of AI into education.

During previous years, the computer played a major role in the educational field, but there has become a radical shift represented by a change in the concept of technology in the curricula. The teachers teach educational materials that focus on the concepts of AI and

advanced technologies, and educational units discuss the concept of robotic devices in the upper grades, giving students a deep understanding of the world of technology. For example, some teachers adopted new strategies for learning programming that aim to develop students' innovative thinking skills and teach them how to control them using specialized electronic boards. Also, the Ministry of Education (MOE) developed an educational environment that enhances the interaction of students and teachers with technological applications and AI.

The MOE implemented a project to train 28 teachers in the field of AI and software to enable them to provide a better educational experience for students, with funding from UNESCO. Teachers face many challenges during the integration of EAITs in education, such as the difficulty of introducing the necessary electronic parts due to political circumstances. Therefore, some teachers try to overcome these challenges by developing simple and innovative applications that work efficiently on simple mobile devices.

The responsible authorities in the MOE spoke about the capabilities of AI and how it opens up amazing opportunities for using it to process data with high efficiency and achieve accurate expectations of student–teacher interaction. There are several examples of experiments that succeeded in improving the quality of education using advanced technologies, including the "Edison" educational robot, which is a programmable robot that follows the STEM methodology and provides interactive educational resources in various fields.

In the classroom, some teachers use generative AI applications to generate texts (e.g., Bard and Chat GPT), generate images from previous texts or images (e.g., Canva and DeepAI), produce video clips (e.g., Hey Gen), or use deep fakes (such as Deep Fake Web). Also, they use EAITs in preparing exams and interactive quizzes, which support multiple formats such as ClassPointAI, ExamSoft, and QuizGecko. However, the highest percentage of teachers do not employ EAITs for several reasons, including lack of technical support, technological illiteracy, lack of conviction in the importance of employing EAITs, or mistrust of AI tools. Teachers also face the problem of high class density, as there is a large number of students, which makes it difficult to employ a specific application based on AI within the classroom.

## Pedagogical Beliefs

People's beliefs are thought to have a significant impact on their conduct. Different studies show that people's beliefs play a crucial role in determining behavior since they have an impact on attitudes, intentions, and actual performance in certain behaviors (Ajzen, 1991). In education, teachers' beliefs have been seen as crucial determinants of how they behave in class (Pajares, 1992). Different studies have highlighted the links between teachers' beliefs and their classroom behavior (Liu et al., 2017). Previously, some studies examined types of teachers' beliefs about using technology in the classroom, including pedagogical beliefs (Liu et al., 2017), self-efficacy beliefs (Abbitt, 2011), and epistemological beliefs (Kim et al., 2013).

Pedagogical beliefs reveal teachers' complex beliefs about learning and teaching (Chan & Elliott, 2004). Transmissive pedagogical beliefs (TPB) and constructivist pedagogical beliefs (CPB) are the two main categories of pedagogical beliefs (Crespo, 2016). The foundation of TPB is behaviorism, which emphasizes the formation of behaviors or behavioral patterns that can be reached through rewards or punishments. Teachers who follow TPB put a lot of effort into sharing their skills and expertise with their students in the classroom and place a strong

emphasis on creating teacher-centered activities and establishing authority in the classroom (Wu et al., 2022). In some previous studies, the term "traditional pedagogical beliefs" has been used in place of the term "transmissive pedagogical ideas" (Chan & Elliott, 2004).

By contrast, CPB confirms that students actively generate knowledge rather than passively consume it, as constructivism is the foundation of CPB. Students can improve their ability to comprehend a specific subject during their learning by taking part in instructive activities that are relevant and encouraging the creation of knowledge by engaging with other students. Teachers who adhere to CPB place a high priority on becoming facilitators in the classroom and fostering an environment of active learning that motivates students to create meaning for themselves (Becker, 2000).

Many studies showed that teachers incorporate technology into the learning environment according to their pedagogical beliefs (Tondeur et al., 2017). According to Becker (2000), teachers with CPB incorporate technology into their classrooms more frequently than those with TPB. Teachers with CPB tend to actively employ digital resources in ways that are student-centered, whereas teachers with TPB use them to promote teacher-centered activities (Kim et al., 2013). In the study of Tondeur et al. (2017), they pointed out that teachers with CPB consider technology as an important learning instrument more than teachers with TPB.

### Perceived Trust

PT is defined as a person's perception of the dependability and credibility of technology (Arpaci, 2016). According to Asan et al. (2020), PT plays a significant role in determining whether or not to accept new technologies. PT is viewed as being more important, especially with AI, because it inherently entails risk and uncertainty. Users' PT is severely impacted by this aspect of AI, which eventually leads to a decreased acceptance rate (Asan et al., 2020). This issue is primarily caused by the complicated algorithm. Because the algorithms are so complicated, it is challenging to understand how the AI arrived at its judgments, which results in a lack of justification for its predictions (Shin, 2021). Also, as the accuracy of the data gathered in the past is crucial for training the AI model, machine learning-based AI is reliant on it. Unfortunately, these data may contain input errors, faults, and biases that may result in inaccurate predictions and recommendations (Zhang et al., 2020).

Previous studies showed that PT is a key predictor of how users perceive the acceptance of new technology. Gefen et al. (2003) investigated users' perceptions of online purchasing and showed that PT significantly influenced PU and BI, while PEU significantly influenced PT. Also, Nikou and Economides (2017) pointed out that student PTs on mobile-based tasks have a positive impact on PU. Moreover, Choi and Ji (2015) investigated user acceptance of autonomous vehicles in the context of AI and noticed that PT improves PU and BI. Although PT between humans and AI has been highlighted in numerous studies, no studies focus on teachers' PT with EAIT.

## Methodology

### Study Design

This mixed-methods cross-sectional study utilized an exploratory sequential design and was conducted in the Gaza Strip, Palestine, between November 20, 2022, and June 30, 2023. In this work, qualitative and quantitative data collection methods and analysis

techniques were used to achieve the objectives of the study. It was confirmed that combining specific features of different approaches to create a mixed structure can strengthen a research method (Patton, 1987). Each research approach has advantages; when the strategies are combined, the research model is further strengthened, and qualitative interpretation can support quantitative research patterns. As a result, findings that are richer in both width and depth can be obtained. Therefore, this study used a survey approach. A survey method is a search approach used to describe an existing instance in its current condition (Karasar, 2007). The target population was teachers who work in private, public, or UNRWA schools in Palestine in the academic year 2022–2023.

## Stage One: Quantitative Study

### The Questionnaire

The quantitative part of the study assessed the teachers' pedagogical principles, PEU, PU, PT, and BI. An online questionnaire with 25 closed-ended questions was prepared by the researchers. The researchers' scale was created using their expertise as well as a thorough analysis of the prior surveys (Choi et al., 2023). The survey was developed to answer inquiries about the teachers' pedagogical principles, PEU, PU, PT, and BI (Appendix 1). The use of surveys helps researchers gather information about participants' emotions, intentions, thoughts, values, attitudes, perceptions, and personalities by using surveys (Johnson & Christensen, 2014). The survey tool was composed of seven sections: (A) demographic information, (B) constructivist pedagogical beliefs (CPB), (C) transmissive pedagogical beliefs (TPB), (D) perceived trust (PT), (E) perceived usefulness (PU), (F) perceived ease of use (PEU), and (G) behavioral intention (BI). This questionnaire utilized a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The researchers created an online survey form in Google Docs and distributed it to the teachers in their respective groups. The teachers were sent a link by email and several digital channels (Messenger, WhatsApp, Facebook, etc.), and it took about 10 min to complete. The questionnaire was presented in the Arabic language. Since Arabic is the mother tongue at the Gaza schools, the survey was translated into Arabic. After carrying out different procedures to verify validity (Kaiser–Meyer–Olkin and Bartlett's tests and item analysis), the scale with 35 items and 7 dimensions was confirmed to be valid and reliable. In this study, the value of Cronbach's alpha coefficient for the overall scale was 0.71, showing that the sample had adequate internal consistency (Taber, 2018). This result revealed the validity and reliability of the scale and demonstrated its value in assessing teachers' attitudes toward the use of AI in education.

### Sample Size Calculation

The study participants were composed of teachers who are teaching in schools affiliated with the Ministry of Education and Higher Education, or UNRWA, in the academic year 2022–2023. A total of 264 teachers participated in the first stage of the study, which examined the pedagogical principles (PEU, PU, PT, and BI) of teachers. In the second stage, 15 teachers attended a session in which their opinions on the use of AI in education were recorded. The participants in this study were chosen using a convenience sampling technique, and the sample size was determined using the following three criteria:

1. Teachers' population size ($N = 23{,}721$)
2. The margin of error was chosen to be $\pm 6\%$ which is an acceptable value for categorical variables (Kotrlik et al., 2001)
3. The confidence level was chosen to be 95%

## Stage Two: Qualitative Study

### Sampling Method and Focus Group Setting

Focus groups were set up as part of the second stage of this study. The qualitative research data were gathered during interviews with focus groups. A group of teachers underwent follow-up focus groups to gain further information about AI in education that was not covered in the questionnaire. Purposive sampling was conducted at this stage. The focus group interviews were undertaken in compliance with the standards for reporting qualitative research set by the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong et al., 2007). A focus group discussion is a series of organized and guided conversations used to determine perceptions on a certain topic in a convenient environment (Nyumba et al., 2018).

Teachers who were willing to participate in the second stage were invited to join the focus groups, which were carried out by two expert researchers. A questionnaire with two open-ended questions was used to guide focus group discussions. The groups, which consisted of 5–8 teachers, met in person and virtually through Zoom. A total of 15 teachers participated in the discussion groups. During the discussion sessions, the researchers recorded the responses for analysis.

### Designed Focus Group Protocol

The interview focus groups were conducted by trained researchers (ER and RA) according to the general guidelines mentioned in the literature review (Krueger, 2014). Each teacher gave their verbal consent after being informed of the study's objectives at the start of the meeting. The teachers were provided with important background information. No follow-up questions were asked, no further information was provided by the interviewers, and no further questions were requested following the meetings. For the interview focus groups, only the interviewers and the teachers were present. To protect the privacy and secrecy of the response, other people were not permitted to attend the interview with the teachers. The researcher asked for permission to record the responses before beginning.

### Data Collection

Data were gathered using in-depth discussions in focus groups. Before the focus group discussions, the research team reviewed the study questions and strategies for gathering trustworthy data. By taking notes during the focus group discussions, the necessary data were recorded. Data were gathered until saturation was reached, at which point meetings stopped discussing new subjects.

### Statistical Analysis

For the statistical analysis, SPSS version 22 was employed in this study. To determine whether the data were normal, the Shapiro–Wilk test of normality was used. As the sample size was greater than 50, the normality of the distribution was assessed using the Kolmogorov–Smirnov test (Mishra et al., 2019). As the criteria for a normal distribution were not fulfilled, the data were expressed as the median (IQR). Thus, non-parametric Mann–Whitney *U* and Kruskal–Wallis tests were used to analyze the data. *P* values $< 0.05$ were considered statistically significant. The Mann–Whitney *U* test and Kruskal–Wallis test were used to evaluate whether demographic characteristics had a significant effect on teachers' perspectives toward employing EAITs in education. The average scores for each domain were analyzed according to Table 1.

To investigate the teachers' experiences in employing EAITs in their classrooms and the challenges they faced, a qualitative inductive content analysis approach was performed to analyze the data collected during interviews with teachers in focus groups. This method comprised the following stages: (1) preparing—which entails transcribing, formatting, and repeatedly going over the data closely, (2) coding—which entails finding and applying specific codes to text segments in cycles, (3) categorizing—which entails improving and reorganizing codes into broader categories, and (4) theorizing—which entails thinking through how categories relate to one another (Thomas, 2006). Line by line, we meticulously went over the text transcriptions, and for every instance, we coded by finding the participants' exact words—without any interpretations. Initially, all of the replies were inductively coded for the major topics. The second stage involved grouping codes based on shared meanings and determining which codes clustered together to establish subthemes. The subthemes were given names that matched the cluster and arranged based on shared meanings. These processes have been carried out by hand. We employed Lincoln and Guba (1985) confirmability, credibility, dependability, and transferability criteria to confirm the rigor of our work. These procedures resulted in three main themes.

## Results

### Demographic Characteristics of Teachers

Two hundred and sixty-four ($N = 264$) teachers completed the online questionnaire. Most of the teachers (87.1%) were females, and 12.9% were males. The age frequency showed that 39.0% of teachers were 31–40 years old, 34.8% were 41–50 years old, 14.0% were 51–60 years old, and the rest were 22–30 years old. In addition, about 37.9% have more

**Table 1** Mean score interpretation framework

| Mean | Corresponding level |
|---|---|
| $1.0 < \text{mean} \leq 1.8$ | Very low |
| $1.8 < \text{mean} \leq 2.6$ | Low |
| $2.6 < \text{mean} \leq 3.4$ | Medium |
| $3.4 < \text{mean} \leq 4.2$ | High |
| $4.2 < \text{mean} \leq 5.0$ | Very high |

than 15 years of work experience in the education field. The majority of teachers (83.7%) employ technological tools in education. With regard to the type of school, 80.3% of teachers work at public schools that are supervised by the Ministry of Education and Higher Education, 15.2% work at schools supervised by UNRWA, and only 4.5% work at private schools. Only 39.8% of teachers confirmed that they joined courses related to the usage of AI in education, whereas 60.2% did not join. Half of the teachers (50.8%) teach scientific subjects (e.g., math, science, and technology), whereas the rest teach art-related subjects (e.g., religion, history, geography, and art) (Table 2).

### Constructivist Pedagogical Beliefs (CPB)

The first dimension asked about teachers' views of constructivist pedagogical beliefs. Participants were asked to rate how much they agreed or disagreed with five questions about their constructivist pedagogical beliefs. Figure 1 shows the frequency of answers to these five items. The findings revealed that most of the teachers (90.9%) strongly agreed or agreed that learning entails giving students lots of chances to investigate, debate, and express their views. Also, the majority of teachers (88.2%) confirmed that each student deserves an education appropriate to his or her special needs, as every student is unique and different from other classmates. Similarly, most teachers strongly agreed or agreed with the idea that it is important that a teacher understands the feelings of their students (97.0%), continues to encourage students to think of answers (98.1%), and provides a democratic atmosphere to stimulate students to interact (87.1%).

**Table 2** Teachers' demographic characteristics ($N = 264$)

| Variable | Category | *N* | % |
|---|---|---|---|
| Gender | Female | 230 | 87.1 |
| | Male | 34 | 12.9 |
| Age | 22–30 | 32 | 12.1 |
| | 31–40 | 103 | 39.0 |
| | 41–50 | 92 | 34.8 |
| | 51–60 | 37 | 14.0 |
| Years of experience (years) | Less than 5 | 33 | 12.5 |
| | 5–10 | 45 | 17.0 |
| | 11–15 | 86 | 32.6 |
| | More than 15 | 100 | 37.9 |
| Use of technological tool in education | Yes | 221 | 83.7 |
| | No | 43 | 16.3 |
| Type of school | Public school | 212 | 80.3 |
| | UNRWA school | 40 | 15.2 |
| | Private school | 12 | 4.5 |
| Attend courses related to AI in education | Yes | 105 | 39.8 |
| | No | 159 | 60.2 |
| Major | Science branch | 134 | 50.8 |
| | Art branch | 130 | 49.2 |
| Total | | 264 | 100.0 |

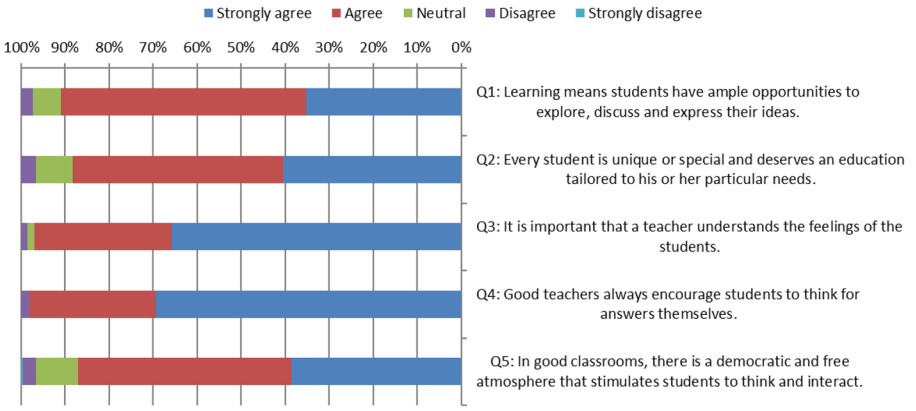


**Fig. 1** Teachers' responses ($n = 264$) on items of constructivist pedagogical beliefs

The results showed that the median value of the total CPB scores was very high (4.40), with a range of 1.80–5.00. Table 3 shows the differences in CPB scores among teachers based on their demographic characteristics. The results revealed that there were no significant differences in CPB scores between teachers according to gender, age, years of experience, use of technological tools in education, type of school, joining courses related to AI in education, and their major.

## Transmissive Pedagogical Beliefs (TPB)

The second dimension asked about teachers' views on transmissive pedagogical beliefs. Participants were asked to rate how much they agreed or disagreed with five questions about their transmissive pedagogical beliefs. Figure 2 shows the frequency of answers to these five items. The findings revealed that 67.8% of teachers strongly disagreed or disagreed with the statement "During the lesson, it is important to keep students confined to the textbooks and the desks," 17.8% strongly agreed or agreed, and 14.4% did not decide. About 43.5% of teachers strongly agreed or agreed that learning to teach means practicing the ideas from lecturers without questioning them; 35.6% strongly disagreed or disagreed with this idea; and the rest of the percentage neither agreed nor disagreed.

The results revealed that two-thirds of teachers (67.0%) strongly disagreed or disagreed with the idea that teaching is telling, presenting, or explaining the subject matter, whereas 16.3% strongly agreed or agreed with this idea. Less than one-fourth of teachers (22.4%) confirmed that good teaching occurs when there is mostly teacher talk in the classroom, whereas 59.9% of them strongly disagreed or disagreed with this opinion. In addition, 60.6% of teachers strongly disagreed or disagreed with the idea that teaching is to provide students with accurate and complete knowledge rather than encourage them to discover it; 20.8% strongly agreed or agreed; and the rest of the teachers (18.6%) were undecided.

The results showed that the median value of the total TPB scores was low (2.40), with a range of 1.00–5.00. Table 4 presents the differences in TBP scores among teachers based on their demographic characteristics. The results revealed that there were no significant differences in TBP scores between teachers according to gender, age, years of experience, use of technological tools in education, type of school, joining courses related to AI in education, and their major.

**Table 3** CBP scores based on demographic characteristics of participants ($n = 264$)

| Variable | Categorize | *N* (%) | Median (IQR) | *p* value |
|---|---|---|---|---|
| **Constructivist pedagogical beliefs (CPB): 4.40 (4.2–4.8)** | | | | |
| Gender | Female | 230 (87.1) | 4.4 (4.2–4.8) | 0.900[a] |
| | Male | 34 (12.9) | 4.4 (4.2–4.6) | |
| Age group | 22–30 | 32 (12.1) | 4.6 (4.4–4.8) | 0.095[b] |
| | 31–40 | 103 (39.0) | 4.4 (4–4.6) | |
| | 41–50 | 92 (34.8) | 4.6 (4.15–4.8) | |
| | 51–60 | 37 (14.0) | 4.4 (4–4.8) | |
| Years of experience (years) | Less than 5 | 33 (12.5) | 4.6 (4.4–4.8) | 0.504[b] |
| | 5–10 | 45 (17.0) | 4.4 (4.2–4.8) | |
| | 11–15 | 86 (32.6) | 4.4 (4–4.75) | |
| | More than 15 | 100 (37.9) | 4.4 (4.2–4.8) | |
| Use of technological tool in education | Yes | 221 (83.7) | 4.4 (4.2–4.8) | 0.443[a] |
| | No | 43 (16.3) | 4.4 (4–4.8) | |
| Type of school | Public school | 212 (80.3) | 4.4 (4.2–4.8) | 0.091[b] |
| | UNRWA school | 40 (15.2) | 4.6 (4.35–5) | |
| | Private school | 12 (4.5) | 4.4 (4.35–4.6) | |
| Attend courses related to AI in education | Yes | 105 (39.8) | 4.4 (4.2–4.8) | 0.092[a] |
| | No | 159 (60.2) | 4.4 (4.2–4.6) | |
| Major | Science branch | 134 (50.8) | 4.4 (4.2–4.8) | 0.969[a] |
| | Art branch | 130 (49.2) | 4.4 (4.2–4.8) | |

[a]Mann–Whitney *U* test

[b]Kruskal–Wallis test

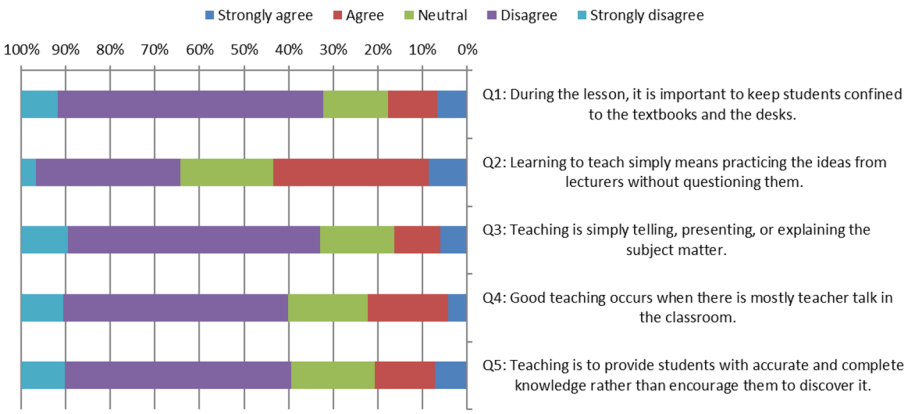


**Fig. 2** Teachers' responses ($n = 264$) on items of transmissive pedagogical beliefs

## Perceived Trust (PT)

The third dimension explores responses from teachers regarding their perceptions of perceived trust. Four statements about the level of perceived trust were given to

**Table 4** TBP scores based on demographic characteristics of participants ($n = 264$)

| Variable | Categorize | *N* (%) | Median (IQR) | *p* value |
|---|---|---|---|---|
| **Transmissive pedagogical beliefs (TPB): 2.40 (2.00–3.05)** | | | | |
| Gender | Female | 230 (87.1) | 2.4 (2–3) | 0.450[a] |
| | Male | 34 (12.9) | 2.8 (2–3.4) | |
| Age group | 22–30 | 32 (12.1) | 2.6 (2–3) | 0.878[b] |
| | 31–40 | 103 (39.0) | 2.4 (2–3.2) | |
| | 41–50 | 92 (34.8) | 2.6 (2–3) | |
| | 51–60 | 37 (14.0) | 2.4 (2–3) | |
| Years of experience (years) | Less than 5 | 33 (12.5) | 2.6 (2.2–3.2) | 0.768[b] |
| | 5–10 | 45 (17.0) | 2.4 (2–3.2) | |
| | 11–15 | 86 (32.6) | 2.5 (2–3.2) | |
| | More than 15 | 100 (37.9) | 2.4 (2–3) | |
| Use of technological tool in education | Yes | 221 (83.7) | 2.4 (2–3) | 0.697[a] |
| | No | 43 (16.3) | 2.4 (2.1–3.1) | |
| Type of school | Public school | 212 (80.3) | 2.4 (2–3) | 0.597[b] |
| | UNRWA school | 40 (15.2) | 2.7 (2–3.25) | |
| | Private school | 12 (4.5) | 2.8 (2.3–3.15) | |
| Attend courses related to AI in education | Yes | 105 (39.8) | 2.6 (2–3.2) | 0.314[a] |
| | No | 159 (60.2) | 2.4 (2–3) | |
| Major | Science branch | 134 (50.8) | 2.4 (2–3) | 0.284[a] |
| | Art branch | 130 (49.2) | 2.6 (2–3.2) | |

[a]Mann–Whitney *U* test

[b]Kruskal–Wallis test

participants, and they were asked to rate how much they agreed or disagreed with each (Fig. 3). The results showed that 65.2% of teachers confirmed that EAIT can provide a reliable decision. Approximately 46.2% of teachers believed that decisions from EAIT were fair, whereas only 12.5% did not. More than half of teachers confirmed that EAIT is dependable (54.2%) and they can trust it (52.2%).

The findings showed that the median value of the total PT scores was high (3.50), with a range of 1.00–5.00. Table 5 illustrates the differences in PT scores among teachers based on their demographic characteristics. The results revealed that there were significant differences in PT scores among teachers according to gender, age, use of technological tools in education, and attending courses related to AI in education. Males had a significantly higher median score of PT when compared to females (4.00 versus 3.50, respectively; $p = 0.033$). Teachers aged 22–30 were the highest in the median score of PT as compared to their other counterparts (3.75; $p = 0.037$). Also, teachers who employ technology in education had a significantly higher median score of PT than teachers who do not employ various technologies in education (3.50 versus 3.25, respectively; $p = 0.010$). Moreover, teachers who attended AI-related courses had a significantly higher median score of PT than teachers who did not attend females (3.75 versus 3.50, respectively; $p = 0.022$).

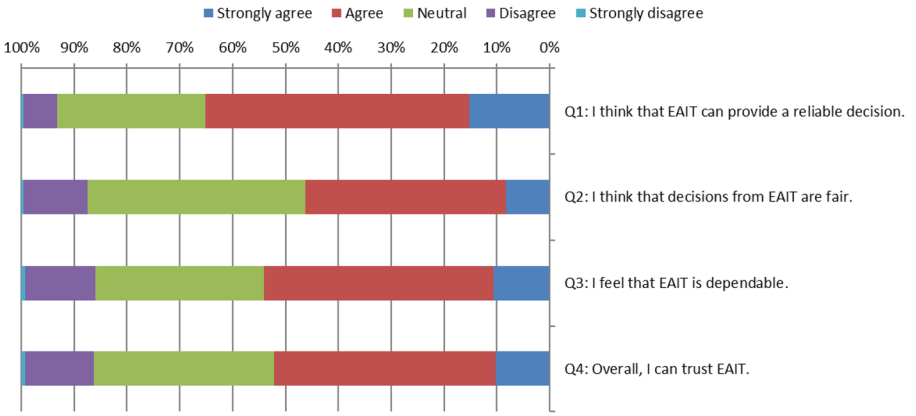


**Fig. 3** Teachers' responses ($n=264$) on items of perceived trust

**Table 5** PT scores based on demographic characteristics of participants ($n=264$)

| Variable | Categorize | *N* (%) | Median (IQR) | *p* value |
|---|---|---|---|---|
| **Perceived trust (PT): 3.50 (3.00–4.00)** | | | | |
| Gender | Female | 230 (87.1) | 3.50 (3–4) | 0.033[a] |
| | Male | 34 (12.9) | 4.00 (3.25–4.4) | |
| Age group | 22–30 | 32 (12.1) | 3.75 (3.25–4) | 0.037[b] |
| | 31–40 | 103 (39.0) | 3.62 (3.25–4.0) | |
| | 41–50 | 92 (34.8) | 3.5 (3–4) | |
| | 51–60 | 37 (14.0) | 3.25 (3–3.75) | |
| Years of experience (years) | Less than 5 | 33 (12.5) | 3.5 (3–4.25) | 0.103[b] |
| | 5–10 | 45 (17.0) | 3.75 (3.25–4) | |
| | 11–15 | 86 (32.6) | 3.5 (3.06–4) | |
| | More than 15 | 100 (37.9) | 3.25 (3–4) | |
| Use of technological tool in education | Yes | 221 (83.7) | 3.50 (3–4) | 0.010[a] |
| | No | 43 (16.3) | 3.25 (2.75–3.8) | |
| Type of school | Public school | 212 (80.3) | 3.5 (3–4) | 0.515[b] |
| | UNRWA school | 40 (15.2) | 3.38 (3–4) | |
| | Private school | 12 (4.5) | 4 (3.44–4.12) | |
| Attend courses related to AI in education | Yes | 105 (39.8) | 3.75 (3–4.25) | 0.022[a] |
| | No | 159 (60.2) | 3.5 (3–4) | |
| Major | Science branch | 134 (50.8) | 3.5 (3–4) | 0.475[a] |
| | Art branch | 130 (49.2) | 3.5 (3–4) | |

[a]Mann–Whitney *U* test

[b]Kruskal–Wallis test

## Perceived Usefulness (PU)

The fourth dimension investigated responses from teachers regarding their perceptions of perceived usefulness. Participants were asked to indicate their level of agreement or disagreement with four statements on perceived usefulness (Fig. 4). The findings showed that most teachers (83.0%) confirmed that using EAIT in their job would increase overall productivity. Also, 78.8% of teachers believed that using EAIT would improve their performance, whereas only 5% did not. The majority of teachers confirmed that would enhance effectiveness in their work (81.9%), and they find it useful (83.3%).

The results showed that the median value of the total PU scores was high (4.00), with a range of 1.00–5.00. Table 6 shows the differences in PU scores among teachers based on their demographic characteristics. The results revealed that there were significant differences in PU scores among teachers according to the use of technological tools in education and attending courses related to AI in education. Teachers who employ technology in education had a significantly higher median score of PU than teachers who do not employ various technologies in education (4.11 versus 3.57, respectively; $p < 0.001$). In addition, teachers who attended AI-related courses had a significantly higher median score of PU than teachers who did not attend (4.20 versus 3.89, respectively; $p = 0.001$).

## Perceived Ease of Use (PEU)

The fifth dimension investigated how teachers perceived ease of use. The frequency of replies to these five items is illustrated in Fig. 5. The findings of the study showed that 61.4% of teachers confirmed that their interaction with EAIT is clear and understandable. Less than half of teachers (46.6%) confirmed that the usage of EAIT does not require a lot of mental effort, whereas 23.9% confirmed that using EAIT requires more mental labor. The results showed that half of the teachers (49.2%) consider EAIT to be easy to use, 28.0% did not decide, and 22.8% said that it is difficult to use it in education. In addition, 60.9% of teachers find it easy to get the system to do what they want it to do, whereas only 13.2% strongly disagreed or disagreed with this opinion.

The results showed that the median value of the total PEU scores was high (3.50), with a range of 1.00–5.00. Table 7 presents the differences in PEU scores among teachers based

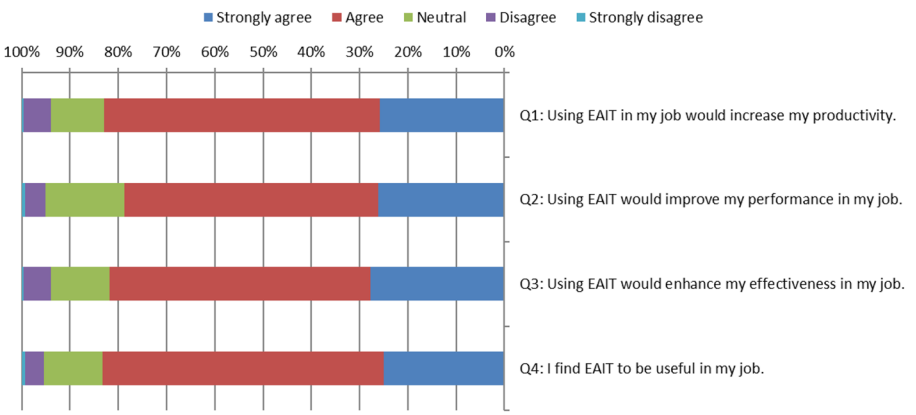


**Fig. 4** Teachers' responses ($n = 264$) on items of perceived usefulness

**Table 6** PU scores based on demographic characteristics of participants ($n = 264$)

| Variable | Categorize | *N* (%) | MD (IQR) | *p* value |
|---|---|---|---|---|
| **Perceived usefulness (PU): 4.00 (3.75–4.5)** | | | | |
| Gender | Female | 230 (87.1) | 4 (3.75–4.5) | 0.235[a] |
| | Male | 34 (12.9) | 4.12 (3.81–4.9) | |
| Age group | 22–30 | 32 (12.1) | 4 (4–4.5) | 0.246[b] |
| | 31–40 | 103 (39.0) | 4 (3.75–4.5) | |
| | 41–50 | 92 (34.8) | 4 (3.5–4.5) | |
| | 51–60 | 37 (14.0) | 4 (4–4.25) | |
| Years of experience (years) | Less than 5 | 33 (12.5) | 4 (4–4.5) | 0.200[b] |
| | 5–10 | 45 (17.0) | 4 (4–4.5) | |
| | 11–15 | 86 (32.6) | 4 (3.75–4.69) | |
| | More than 15 | 100 (37.9) | 4 (3.5–4.25) | |
| Use of technological tool in education | Yes | 221 (83.7) | 4 (4–4.5) | < 0.001[a] |
| | No | 43 (16.3) | 3.75 (3–4) | |
| Type of school | Public school | 212 (80.3) | 4 (3.75–4.31) | 0.088[b] |
| | UNRWA school | 40 (15.2) | 4.12 (3.94–5) | |
| | Private school | 12 (4.5) | 4.12 (4–4.44) | |
| Attend courses related to AI in education | Yes | 105 (39.8) | 4 (4–5) | 0.001[a] |
| | No | 159 (60.2) | 4 (3.5–4.25) | |
| Major | Science branch | 134 (50.8) | 4 (3.75–4.5) | 0.496[a] |
| | Art branch | 130 (49.2) | 4 (3.75–4.5) | |

[a]Mann–Whitney *U* test

[b]Kruskal–Wallis test

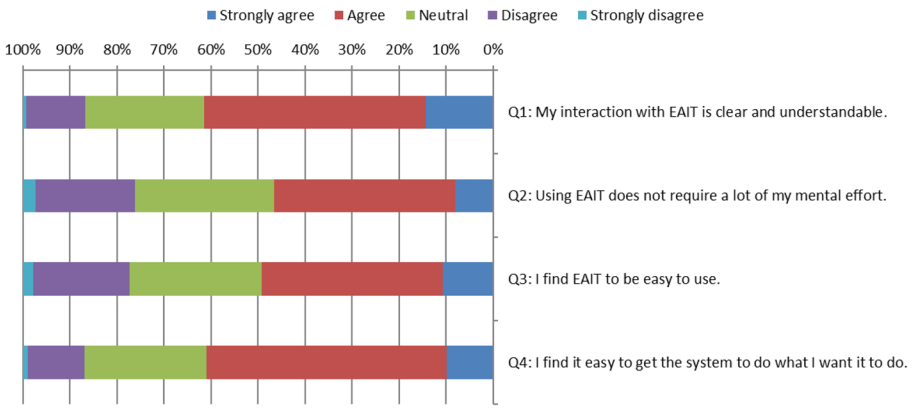


**Fig. 5** Teachers' responses ($n = 264$) on items of perceived ease of use

on their demographic characteristics. The results revealed that there was a significant difference in PEU scores among teachers according to the type of school, use of the technological tool in education, and attendance at courses related to AI in education. Teachers who work in private schools had the highest median score of PEU as compared to their

counterparts (4.00; $p=0.014$). Also, teachers who employ technology in education had a significantly higher median score of PT than teachers who do not employ various technologies in education (3.75 versus 3.00, respectively; $p=0.001$). Moreover, teachers who attend AI-related courses had a significantly higher median score of PEU than teachers who do not attend females (3.75 versus 3.25, respectively; $p<0.001$).

### Behavioral Intention (BI)

The last dimension inquired about the behavioral intentions of teachers. The participants were asked to rate their behavioral intention using EAIT in education by rating three items on a Likert-type scale. The frequency of replies to these 10 items is displayed in Table 8. The results revealed that the majority of teachers (82.2%) confirmed that they intend to use EAIT when they have the opportunity to access it. Also, 81.1% of teachers predicted that they would use it if they had access to it, whereas only 5.3% did not. Moreover, approximately 81.4% of teachers plan to use EAIT in their future work in school; 11.7% are undecided; and the rest of the teachers (6.8%) confirm that they do not plan to employ it to achieve educational tasks in their schools (Fig. 6).

The results showed that the median value of the total BI scores was high (4.00), with a range of 1.00–5.00. Table 8 shows the differences in BI scores among teachers based on their demographic characteristics. The results revealed that there were significant

**Table 7** PEU scores based on demographic characteristics of participants ($n=264$)

| Variable | Categorize | *N* (%) | MD (IQR) | *p* value |
|---|---|---|---|---|
| **Perceived ease of use (PEU): 3.50 (3.00–4.00)** | | | | |
| Gender | Female | 230 (87.1) | 3.5 (3–4) | 0.261[a] |
| | Male | 34 (12.9) | 3.75 (3–4) | |
| Age group | 22–30 | 32 (12.1) | 3.62 (3.19–4) | 0.429[b] |
| | 31–40 | 103 (39.0) | 3.75 (3–4) | |
| | 41–50 | 92 (34.8) | 3.5 (2.75–4) | |
| | 51–60 | 37 (14.0) | 3.25 (3–4) | |
| Years of experience (years) | Less than 5 | 33 (12.5) | 3.5 (2.75–4) | 0.802[b] |
| | 5–10 | 45 (17.0) | 3.75 (3–4) | |
| | 11–15 | 86 (32.6) | 3.5 (3–4) | |
| | More than 15 | 100 (37.9) | 3.5 (3–4) | |
| Use of technological tool in education | Yes | 221 (83.7) | 3.75 (3–4) | 0.001[a] |
| | No | 43 (16.3) | 3 (2.5–3.88) | |
| Type of school | Public school | 212 (80.3) | 3.5 (2.75–4) | 0.014[b] |
| | UNRWA school | 40 (15.2) | 3.88 (3–4.31) | |
| | Private school | 12 (4.5) | 4.0 (3.5–4.06) | |
| Attend courses related to AI in education | Yes | 105 (39.8) | 3.75 (3.25–4) | < 0.001[a] |
| | No | 159 (60.2) | 3.25 (2.75–4) | |
| Major | Science branch | 134 (50.8) | 3.5 (2.81–4) | 0.421[a] |
| | Art branch | 130 (49.2) | 3.5 (3–4) | |

[a]Mann–Whitney *U* test

[b]Kruskal–Wallis test

**Table 8** BI scores based on demographic characteristics of participants ($n = 264$)

| Variable | Categorize | *N* (%) | MD (IQR) | *p* value |
|---|---|---|---|---|
| **Behavioral intention (BI): 4.00 (3.67–4.33)** | | | | |
| Gender | Female | 230 (87.1) | 4 (3.67–4.33) | 0.594[a] |
| | Male | 34 (12.9) | 4 (3.67–4.58) | |
| Age group | 22–30 | 32 (12.1) | 4 (4–4.67) | 0.079[b] |
| | 31–40 | 103 (39.0) | 4 (3.67–4.33) | |
| | 41–50 | 92 (34.8) | 4 (3.67–4.08) | |
| | 51–60 | 37 (14.0) | 4 (3.67–4) | |
| Years of experience (years) | Less than 5 | 33 (12.5) | 4 (3.67–4.67) | 0.122[b] |
| | 5–10 | 45 (17.0) | 4 (4–4.67) | |
| | 11–15 | 86 (32.6) | 4 (4–4) | |
| | More than 15 | 100 (37.9) | 4 (3.58–4.08) | |
| Use of technological tool in education | Yes | 221 (83.7) | 4 (4–4.33) | 0.002[a] |
| | No | 43 (16.3) | 3.99 (3.17–4) | |
| Type of school | Public school | 212 (80.3) | 4 (3.67–4.33) | 0.116[b] |
| | UNRWA school | 40 (15.2) | 4 (3.67–4.33) | |
| | Private school | 12 (4.5) | 4.17 (4–4.75) | |
| Attend courses related to AI in education | Yes | 105 (39.8) | 4 (4–4.67) | 0.001[a] |
| | No | 159 (60.2) | 3.99 (3.67–4) | |
| Major | Science branch | 134 (50.8) | 4 (4–4.58) | 0.009[a] |
| | Art branch | 130 (49.2) | 3.99 (3.67–4) | |

[a]Mann–Whitney *U* test

[b]Kruskal–Wallis test

differences in BI scores among teachers according to the use of technological tools in education, attending courses related to AI in education, and major. Teachers who employ technology in education had a significantly higher median score of BI than teachers who do

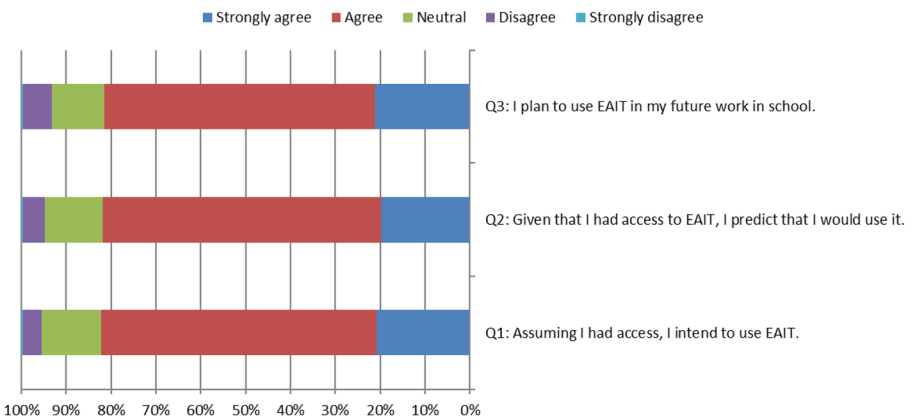


**Fig. 6** Teachers' responses ($n = 264$) on items of behavioral intention

not employ various technologies in education (4.00 versus 3.99, respectively; $p=0.002$). Moreover, teachers who attended AI-related courses had a significantly higher median score of BI than teachers who did not attend (4.00 versus 3.99, respectively; $p=0.001$). In addition, teachers who have a scientific background had a significantly higher median score of BI than teachers who have an art background (4.00 versus 3.99, respectively; $p=0.009$).

## Opinions of Teachers on Using EAITs in Education

The qualitative analysis revealed three main themes: advantages of using EAITs in education, disadvantages of using EAITs in education, and challenges related to incorporating EAITs in the future (Table 9).

The final research question focused on teachers' perceptions about using EAITs in education. A semi-structured online interview technique was used for the analysis of this question in order to elicit instructors' ideas and opinions on their experience in employing EAITs in their classrooms. Teachers' responses to the question: "What do you think the benefits of using EAITs in education are?" demonstrated how the teachers felt that using EAITs had many advantages for both students and teachers. The following are a few of the teachers' responses to this question.

T1: "AI may give students tailored feedback and recommendations, resulting in a more interesting and effective learning experience. The incorporation of AI into the classroom has the potential to transform the way students learn and teachers teach."

T2: "Giving students a more individualized learning experience is one of the main advantages of incorporating AI in the classroom. AI algorithms are able to assess student data, adjust to their learning preferences, and provide feedback and suggestions that are specific to each student's needs and aptitudes. This can maintain students' interest and motivation, which will benefit their academic achievement."

T3: "Deepening students' comprehension of this quickly-evolving technology is another advantage of using EAITs in education. Teachers may assist students in building a critical understanding of AI by introducing it into the curriculum. This will also help them get ready for the opportunities and problems of the digital age."

**Table 9** Main themes and subthemes resulting from interviews with teachers on using EAITs in education

| Main themes | Subthemes |
|---|---|
| Advantages of using EAITs in education | Constructive feedback and recommendations |
| | Acquiring crucial 21st-century skills |
| | Personalized studying |
| | Enhance academic performance |
| Disadvantages of using EAITs in education | Cost |
| | Bias |
| | Privacy |
| | Technological illiteracy |
| Challenges related to incorporating EAITs in the future | Social challenges |
| | Economic challenges |
| | Ethical challenges |
| | Technological challenges |

T4: "AI integration in education can also assist students in acquiring crucial 21st-century abilities such as cooperation, critical thinking, and problem-solving. These skills can be developed through practical use of EAITs and applications and are crucial for success in the digital age."

Teachers' answers to the question: "What do you think the challenges of using EAITs in education are?" demonstrated that the teachers acknowledged various difficulties and limitations with the incorporation of EAITs. The following are some of the teachers' responses to this question.

T1: "Despite these potential advantages, there are a number of difficulties and challenges in incorporating AI in education. The requirement for technical skills is one of the main obstacles. It may be challenging for teachers who are unfamiliar with EAITs to incorporate this technology into their teaching practices, and they may require assistance and training to get going."

T2: "The price of AI tools and apps is the main difficulty in incorporating EAITs in education. Many schools, colleges, and universities lack the funds to buy and maintain the equipment required to implement AI in the classroom; therefore, they may need to look for outside funding or collaborations to help them."

T3: "There are ethical issues associated with incorporating EAITs in education. As AI develops, there are worries about how it will affect employment markets, security, and privacy. Teachers need to be aware of these worries and do their part to protect their pupils as they experiment with this fascinating and quickly developing technology."

T4: "AI might not be able to process some features (such as visuals, photos, or text). Also, AI systems are not trustworthy enough to give teachers the information they can use; the absence of technology infrastructure in schools and the lack of technological understanding among teachers are considered the main obstacles. Additionally, AI-based feedback might be slow."

Furthermore, during the discussions with participants who participated in the focus groups, we found differences in their perceptions of EAITs, as some participants considered AI chatbots more useful than others. On the other hand, some participants mentioned that they trust AI-automated grading more than other tools. Also, some participants thought that AI-based smart content could provide a more reliable decision than other tools.

## Discussion

The present study is aimed at investigating teachers' perceptions of accepting EAITs. To achieve the research objective, two hundred and sixty-four ($N=264$) teachers completed the online questionnaire. This study was the first to highlight the teachers' perspective on using EAITs in education in Palestine.

### Constructivist Pedagogical Beliefs (CPB)

The first dimension examined teachers' views of constructivist pedagogical beliefs. The results showed that most teachers strongly agreed or agreed that (1) learning entails giving students lots of chances to investigate, debate, and express their views; (2) each student deserves an education appropriate to his or her special needs; (3) important understands the feelings of students; (4) continues to encourage students to think of answers; and (5) provides a democratic atmosphere to stimulate students to interact. The results showed that

the median value of the total CPB scores was very high. This obtained result is expected among Palestinian teachers due to several reasons, including the interest of the Palestinian Ministry of Education to join teachers in training courses related to the use of modern technological tools in education, such as augmented reality, 3D printing, and hologram technology. In addition, some teachers attended scientific workshops and conferences related to the importance of employing AI in education, as teachers became aware of the topics related to it. Within the development plan for the Palestinian educational system, the greatest focus has become on employing active learning strategies in education. This means that teachers have an interest in the student inside the classroom, where they consider students as a key element of the educational process. Most teachers emphasize the necessity of involving the student in activities and debates, giving them the opportunity for dialog and discussion, and taking into account the individual differences and needs of each student. These factors encourage teachers to build highly constructivist pedagogical beliefs, which enhance their beliefs toward employing EAITs in education.

This result was consistent with the previous study on the pedagogical beliefs of teachers and how they see the use of ICT in the classroom. For instance, Liu et al. (2017) found that English-as-a-foreign-language (EFL) teachers are more likely to view ICT as intuitive and practical when they are more constructivist-oriented. Also, in the study of Gurer and Akkaya (2021), they revealed that the CPB of pre-service teachers has a good impact on their desire to integrate ICT in education. These results led us to the conclusion that teachers are more likely to accept EAIT when they are more constructivist-oriented. This belief is a key determinant of how likely it is that they will use EAITs. It was reported that teacher beliefs influence teaching approaches and activities in the classroom. According to Hermans et al. (2008), constructivist beliefs are positively connected with the use of technology in the classroom, but conventional beliefs are adversely correlated with it. In order to meet students' needs when studying complicated material, teachers are now expected to retain their learner-centered teaching beliefs and employ constructivist-based teaching strategies. However, even though some teachers have sufficient experience in employing technological tools (including AI), they may still choose not to or be hesitant to include technology in their lessons (Hermans et al., 2008).

The authors of the current study hypothesized that these "surprises" may be related to a finding from Becker (2000), that is, teachers with traditional beliefs were more constructivist than those who did not use technology at all, even though they tended to use technology in a more traditional manner than their counterparts who held constructivist beliefs. These findings ought to draw academics' attention to the concept of original, inventive, and active use of technology.

### Transmissive Pedagogical Beliefs (TPB)

The second dimension asked about teachers' views on transmissive pedagogical beliefs. The results revealed that the median value of TPB for teachers was low. This might be due to the fact that the respondents were much more constructivist-oriented than transmissive-oriented, which in turn might be related to their geographical location or the type of school they work at. As a result, their low levels of transmissive orientation may have prevented any potential unfavorable attitudes toward technology from developing.

The results showed that more than half of teachers strongly disagreed or disagreed with keeping students confined to textbooks and desks. Also, some teachers strongly disagreed or agreed that learning to teach means practicing the ideas of lecturers without questioning

them. In addition, the results revealed that some teachers strongly disagreed or disagreed with the idea that teaching is telling, presenting, or explaining the content of the course. Good teaching occurs when most teachers talk in the classroom, and teaching is to provide students with accurate and complete knowledge rather than encourage them to discover it. The study found that transmissive pedagogical beliefs affect the teachers' perceptions of using EAITs in education.

This result is attributed to the fact that teachers have become aware of the need for teaching not to be limited to explaining and presenting information but rather for students to actively participate in technological tools, activities, discussions, and assignments inside and outside the classroom. Teachers believe that most of the talk should be given to the student, and they should be given the opportunity to interpret, explain, and answer questions, as well as participate in critical thinking, divergent thinking, and brainstorming sessions.

Fraillon et al. (2014) conducted a survey of 35,000 teachers and found that while they used technology extensively and generally had positive opinions of it, they frequently used it for relatively simple tasks (like word processing and presentations) rather than more difficult ones like creating digital games and e-portfolios. In the study of Li (2014), he revealed that, despite the teachers' positive attitudes toward technology, computer use by language teachers in China was frequently limited to PowerPoint presentations of information. Therefore, it is important to pay close attention to teachers who exhibit enthusiasm for ICT but nevertheless utilize it in conventional ways that might not be beneficial to and might even be detrimental to student-centered learning processes.

### Perceived Trust (PT)

The third dimension explores responses from teachers regarding their perceptions of perceived trust. The results showed that more than half of teachers confirmed that EAIT can provide a reliable decision, that EAIT is dependable, and that they can trust it. However, less than half of teachers believed that decisions from EAIT were fair. Additionally, the results demonstrated that the median value of the teachers' PT scores was high, indicating the importance of developing reliable EAITs in order to boost teachers' acceptance. Teachers' PT in EAIT is a significant signal for predicting their intentions to utilize EAITs. Similar results were reported in the study of Choi et al. (2023), who found that perceived trust in EAITs is considered an important factor in teachers' acceptance of EAITs.

Moreover, the results showed that males had a significantly higher median score of PT than females. The previous studies on gender and technology use (including EAITs) reported that men and women have very different perceptions toward their technological abilities and using technology for learning, teaching, or education (Cai et al., 2017; Park & Kim, 2020; Sun et al., 2007; Yau & Cheng, 2012). These differences are attributed to the fact that course-related activities and courses are typically male-dominated activities; females are less likely than males to be interested in taking them; therefore, females stop utilizing technology to learn or teach. Females tend to be less confident than males, despite the fact that they may be interested in adopting technology for learning (Cai et al., 2017). In addition, young teachers had the highest median score of PT as compared to older teachers. It was found that older adults use fewer technologies and utilize them less frequently than younger adults, but they have used them for a longer length of time (Quittschalle et al., 2020; Vasilescu et al., 2020). The main reason may be that younger teachers are more skilled at using technological tools, have more expertise in dealing with EAITs in education, and can more effectively incorporate ICT into their classrooms.

Also, teachers who employ technology in education and those who attend AI-related courses had a significantly higher median score of PT. A previous study confirmed the role of trust in affecting the attitudes of people (including teachers) toward the acceptance of AI technologies (Choung et al., 2022). This result is attributed to the fact that teachers who attended AI-related courses have more experience in employing EAITs and are more confident in employing these technologies in education.

On the other hand, several studies revealed that teachers' reluctance to use technology and their negative attitudes toward it prevented technology from being fully embraced (Istenic et al., 2021). Teachers' comfort zones, their apprehension about utilizing new technology, and their desire to stick to the same resources and didactics are some of the factors impeding their adoption (Tallvid, 2016; Zimmerman, 2006). These factors might also make it more difficult for teachers to use AI tools in the classroom. One of the difficulties in teacher education is eradicating pre-service fear and building faith in AI. Moreover, the media shapes educators' ideas about artificial intelligence (AI) by suggesting that it will supplant human labor without providing them with detailed information on how AI might improve instruction and learning (Luckin & Holmes, 2016). This suggests that pre-service teachers may not have the necessary AI understanding and abilities. As a result, developing new competencies for in-service and pre-service teachers in the context of AI is another issue for teacher training programs. Future teachers must possess the following abilities in order to deal with the development of AI education: a thorough awareness of the ways in which AI systems support learning, research and data analysis capabilities, and newfound teamwork and management abilities (Luckin & Holmes, 2016).

### Perceived Usefulness (PU)

The results showed that the median value of the total PU scores was high. Most teachers confirmed that using EAIT in their job would increase overall productivity, improve their performance, and enhance effectiveness in their work. Also, the results revealed that teachers who employ technology in education and those who attend AI-related courses had the highest median score of PU. It was reported that perceived usefulness was found to be a significant predictor of a teacher's behavioral intention to use social networking sites and AI technologies for e-learning in education (Elkaseh et al., 2016; Wang et al., 2021). This result is attributed to the fact that those teachers who employ technology in education and attend AI-related courses are more trusting in employing AI in education, which affects their perceived usefulness. Similar results were reported in the study of Al Shamsi et al. (2022), who reported that trust is considered an important factor in affecting the perceived usefulness of participants. According to Ambalov (2021), PU is considered the most important predictor of intention to accept and use technology. Also, it was reported that PU has an impact on technology adoption and AI among participants (Damerji & Salimi, 2021).

### Perceived Ease of Use (PEU)

The results showed that the median value of the total PEU scores was high. More than half of teachers consider their interaction with EAIT to be clear and understandable and find it easy to get the system to do what they want it to do. Less than half of teachers confirmed that the usage of EAIT does not require a lot of mental effort and considered EAIT to be easy to use. Teachers who work in private schools, employ technology in education,

and attend AI-related courses had the highest median score in PEU. This result can be attributed to the fact that teachers differ from each other in their personal, individual, technological, and educational characteristics, which affect PEU. Teachers who attend AI-related courses and employ technological tools in education have more quick responses, easy navigation, a good and fit interface, and access to these tools anywhere, anytime. It was reported that self-efficacy and computer anxiety, as well as the qualities of the website, simplicity of understanding, and discovery, had a substantial impact on PEU (Brown, 2002). Based on recent studies, PEU is considered a main factor in determining the acceptance and adoption of technology by users (Choi et al., 2023; Huang et al., 2022). According to Chatterjee et al. (2020), the findings demonstrate that perceived ease of use has a key impact on employees' behavioral intentions to use AI systems in the workplace.

The current study showed that teachers who work in private schools got higher scores in PEU and are more likely to employ AI in education. This result is attributed to the fact that private schools provide the capabilities that help teachers employ modern technology methods in teaching because they have more financial support and funding than public schools. Recently, parents may have been asked to pay "voluntary" fees by public schools to improve their educational offerings and infrastructure. The demand for schools and their communities to raise money has probably increased as public schools find themselves in a more competitive market (Rowe & Perry, 2020). There are large inequalities between public schools, with high-SES schools benefiting from more than four times the parent-generated cash of low-SES schools. Parental financial support is a type of structural inequality that favors socially advantaged students and institutions, and it may be both the cause and the effect of socially segregated education (Rowe & Perry, 2020). A similar situation is still present in private and public schools in low-income countries like Palestine. In the study of Sinclair and Brooks (2022), they reported that students' educational prospects, qualities, and outcomes might change significantly depending on the distribution of financial support to the education sector by the government and other agencies. Therefore, teachers in private schools are more likely to employ EAITs in education due to the availability of financial support and capabilities for teachers and students, while public schools in the Gaza Strip suffer from great weakness and scarcity in material capabilities, and this is due to the hard economic status of Palestinian people (Marbán et al., 2021).

It was reported that ease of use and perceived usefulness are both impacted by the personal learning environment. Perceived ease of use was found to have a mediation relationship between attitude, satisfaction, and personal learning environment (Kashive et al., 2020). Therefore, it is very important to know the perceptions of the users toward AI and their effect on the perceived ease of use to improve the attitude of teachers toward using EAITs in education.

### Behavioral Intention (BI)

The results showed that the median value of the total BI scores was high. The majority of teachers confirmed that they intend to use EAIT when they have the opportunity to access it and would use it. If they have access to it and plan to use EAIT in their future work in school, teachers who employ technology in education, attend AI-related courses, and have scientific backgrounds were the highest in the median score of BI. This result is attributed to the fact that teachers have positive attitudes toward the use and employment of EAITs in education; therefore, they have the intention to employ them, including IA, in the future. In the study of Mailizar et al. (2021), they revealed

that the most important component to forecasting participants' behavioral intention to utilize e-learning was their attitude toward e-learning use. In addition, Alharbi and Drew (2014) found an association between perceived usefulness, perceived ease of use, attitude toward usage, and overall impact on behavioral intention to use. This result is in agreement with the previous study on estimating teachers' behavioral intentions to use digital learning models (Songkram & Osuwan, 2022). As a result, attitude (ATT) was found to have the greatest influence on behavioral intention (BI) to use digital learning platforms. Additionally, PU and PEU operate as mediators of external factors that affect teachers' attitudes toward new digital learning (Songkram & Osuwan, 2022).

Numerous empirical studies have shown that behavioral intention is a good predictor of real behavior since it has a strong correlation with actual technology use (Mardiana et al., 2015). Previous studies showed that perceived usefulness positively impacts behavioral intention, whereas perceived usefulness is more influential (Faqih, 2016). Users' intentions to utilize AI would grow if it were regarded as useful and trustworthy, and researchers looked at the influence of perceived organizational support on these outcomes (Park & Jung, 2021). It was reported that teachers' favorable attitudes and behavioral intentions toward using EAIT tools in the future were improved by their perception of how simple they were to use and their possession of the requisite abilities (Al Darayseh, 2023). Therefore, behavioral intention plays an important role in the acceptance of teachers employing EAITs in education.

## Conclusion

EAIT offers resources to help teachers make better pedagogical decisions that are advantageous to both teachers and students. To work effectively with an EAIT, it is important to understand the variables that influence or limit teachers' intent to use EAITs. This study is to examine teachers' perceptions toward employing EAITs in education. The findings showed that teachers' pedagogical ideas are important in determining whether or not they will embrace EAITs, and constructivist-oriented teachers are more likely to adapt to EAITs. The findings also indicated that teachers' perceived trust, perceived usefulness, perceived ease of use, and behavioral intention are also considered important factors. Teachers are more likely to adapt EAITs to a greater extent when they perceive them to be more trustworthy.

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**Data Availability** The authors can provide the data generated or analyzed upon request from the corresponding author.

## Declarations

**Ethics Approval** The authors declared that the study was performed per the ethical standards laid down in the Declaration of Helsinki. This study was approved by the Ethics Committee of the Ministry of Education and Higher Education (January 26, 2023; No. 500). Informed consent was obtained for all participants.

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