



## Teachers' Competencies in Implementing Technologies and Artificial Intelligence Applications to Teach Students with Disabilities in Inclusive Classrooms in Saudi Arabia

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### ABSTRACT

**Purpose:** Literature has underscored the pivotal role of technologies and artificial intelligence (AI) applications in the education field, particularly in supporting teachers who teach students with disabilities in inclusive classrooms. Therefore, this study aimed to evaluate teachers' competencies in using both technology and AI applications in inclusive classrooms and examine potential variables (teaching experience, type of disability, level of teaching, and teacher's specialty) that may influence teachers' competencies in using technology and AI applications. **Methodology:** This study employed a quantitative survey approach and used multiple statistical techniques for analysis. Data were collected through simple random sampling, comprising 100 elementary- and secondary-level teachers of Riyadh, Saudi Arabia.

**Findings:** Participants reported a high level of competency in using technologies in inclusive classrooms but a relatively lower level of competency in using AI applications. Additionally, the findings revealed that there were statistically significant differences in using technologies based on the variable of teacher specialty whereas there were no statistically significant differences among the participants in using technologies and AI applications based on teaching experience, type of disability, or level of teaching. **Implication for Research and Practice:** Findings of the study highlight the importance of conducting workshops and training programs for teachers to promote their competency in using AI applications to teach students with disabilities in inclusive classroom. Future research should examine how technologies and AI competencies translate into practical teaching practices and collaborative learning in inclusive classrooms.

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## Introduction

Saudi Arabia has been a pioneer country in the Arab region to integrate students with disabilities in mainstream schools. In 1984, the Ministry of Education initiated that students with disabilities in the eastern region of Saudi Arabia should be moved to study into general education schools (Al-Mousa et al., 2006). This initiative provided an opportunity

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for students with disabilities to attend schools alongside students without disabilities. In 1996, the Ministry expanded this initiative in the entire country by allowing students with disabilities in all its regions to study in special education classes in mainstream schools (Al-Mousa et al., 2006). By the end of the twentieth century, inclusion had gained international recognition as a key philosophy in educational development. In 2008, after the UNESCO International Conference on Education in Geneva, Saudi Arabia emphasized the need for taking practical steps to promote inclusive education (Al-Mousa, 2010). By 2015, with the help of technology, the Saudi Educational system had begun taking concrete steps toward implementing inclusive education, and the number of students with disabilities increased in inclusive schools.

Johannesen, Øgrim and Giæver (2014) indicated that teaching with the use of technology entails “the pedagogical idea of using technology for learning” in all subjects (p. 309). Technology thus inevitably became an integral part of the educational environment. From digital books, interactive whiteboards, online platforms, tablets and assistive tools, technology reshaped the settings of inclusive classrooms as well. Technology enhanced students’ classroom participation by restructuring educational processes and applying teaching and classroom management strategies (Gocen & Aydemir, 2020). Building on the advancement of technology, Artificial Intelligence (AI) thus emerged as a key driver to facilitate the integration of technology with education. The teaching practices in inclusive classrooms boosted with the integration of technology with education.

With the integration of technology in inclusive classrooms, there was also a need to address various issues that emerged with this integration. This study assessed the level of teachers’ competencies in implementing technologies and AI applications in inclusive classrooms. This assessment was done by measuring the statistically significant differences in teachers’ competencies in using technology and AI in inclusive classrooms based on their teaching experience, level of teaching, type of disability, and teaching specialty.

## Literature Review

### *Artificial Intelligence in Education*

The concept of Artificial Intelligence (AI) in Education, which emerged in the 1970s, aimed to develop teachers who are mindful of the emotional, cognitive, and psychological aspects of students in the educational process, focusing on computer science, education, and psychology (Woolf, 2009). AI applications can serve as virtual assistants for teachers, facilitating interactions by asking questions and providing instructions to students under teacher supervision (Ramesh & Sanampudi, 2022). These applications assist teachers in understanding learners’ behavior by interpreting and analyzing students’ data, enabling better decision-making and improvements in educational inputs (Sedrakyan et al., 2020). AI tools also aid in assessing student learning and tracking their progress, allowing teachers to provide appropriate support and assistance (Ng et al., 2023). AI is one of the most interesting and developed fields of the 21st century. Its growth is accelerating globally, with countries, such as the United States, China, the United Kingdom, Canada, and Japan, leading innovations and progress in this field (World Economic Form, 2024).

To keep pace with this development, the Kingdom of Saudi Arabia established the Saudi Data and Artificial Intelligence Authority (SDAIA) in 2019 to lead the national agenda for data and AI. This step reflects the Kingdom's belief in the imperative role of technology in the lives of people in general and specifically for individuals with disabilities. The SDAIA seeks to empower people with disabilities by providing digital services and leveraging technology to enhance their quality of life across various levels. It coordinates and collaborates with relevant authorities, including the Ministry of Education, to integrate AI services into the education of individuals with disabilities (SDAIA, 2024). AI is among the technologies leveraged to enhance the various dimensions of digital competence (Galindo-Domínguez et al., 2024; Kunama & Leeratanavalee, 2023). It emerged in the 1950s when algorithms were developed to solve problems in an organized and structured manner (Frankish & Ramsey, 2014; Rosen, 2022). AI is defined as "the capability of machines to imitate intelligent human behaviors. This may involve performing various cognitive tasks, such as sensing, processing oral language, reasoning, learning, making decisions, and demonstrating the ability to manipulate objects accordingly" (UNCTAD, 2017). AI has become a feature of our daily lives, as it plays an important role in various fields, including education (Frankish & Ramsey, 2014).

### *Integration of Artificial Intelligence in Inclusive Classrooms*

The challenges faced by people with disabilities stem from the surrounding environment as well as from societal attitudes toward their disabilities rather than the disability itself being an inherent challenge (Hasbullah, 2022; Levitt, 2017). Hence, there is a need to encourage the development and improvement of educational services provided to people with disabilities (de Wolfe, 2002), including the integration of AI technology in their educational process. Studies have revealed the significant role of technology in education, especially for students with disabilities. An important subset of technology in education is Assistive Technology (AT), which has been used for decades to support diverse learners. AT is a program or device that helps people with disabilities perform their tasks effectively (Cook, Polgar, & Encarnação, 2020; Mole, 2013). Fernández-Batanero et al. (2022), in a systematic review of AT's use in inclusive education for students with disabilities, found that AT is successful in enhancing the inclusion and accessibility of students with disabilities, but faces challenges such as inadequate teacher education and limited information. Further, technology has contributed to improving the effectiveness of implementing distinct pedagogies in large classrooms, an achievement previously unattainable (Muthuswamy & Sharma, 2023; Renz & Hilbig, 2020).

AI has emerged as a pivotal force in developing educational practices by offering a broader realm of technology. Studies have emphasized the importance of AI in enhancing the educational process and supporting educational strategies in inclusive classrooms, particularly in meeting the needs of students with diverse disabilities (Ouyang & Jiao, 2021). AI bridges the gap between learners by ensuring that all students are involved in classrooms, allowing them to advance at their own pace. Research has confirmed that AI empowers all students and provides them with access to appropriate educational opportunities. It also contributes to raising the level of knowledge among students with and without disabilities by 80% and eliminates some

of the challenges and barriers they face (Barrett et al., 2019). Studies have found that AI techniques are effective in delivering curricula and smart learning environments, thereby positively impacting students (Kudaibergenova et al., 2022; Mohammed & 'Nell' Watson, 2019). Moreover, AI applications can remove accessibility barriers by helping identify students with visual impairment through facial image recognition, interpreting lip reading for students with visual and hearing disabilities, and providing translation for students with hearing impairment and those who do not speak the language (Ma & Huang, 2024; Martinez, 2022).

A recent study by Hyatt and Owenz (2024) explored whether Universal Design for Learning (UDL) can be integrated with AI to create an inclusive pedagogy for students with disabilities. The study indicated that AI can be integrated into the UDL model to create an educational environment that suits the needs of all students with disabilities. The results of the study demonstrated the complete satisfaction of university students with disabilities in using AI applications and its effectiveness in classrooms. Furthermore, researchers noted that teachers often spend a considerable amount of time on routine and other administrative tasks. However, in AI-supported classrooms, they spend less time on routine procedures, allowing them to focus more on students with disabilities (Pedro et al., 2019). In the context of the social model perspective and given the above-mentioned literature on technology and AI in education, the absence of technologies and AI applications in inclusive classrooms may be considered an environmental obstacle.

Teachers play a vital role in the success of the educational process. It has been indicated that the participation behavior exhibited by students with and without disabilities in the classroom may be the result of the teacher's practices, strategies applied, and tools used to create learning opportunities for them (Greenwood, Delquadri, & Hall, 1984). Due to the important role that teachers play, AI-based tools are becoming more teacher-focused, and integrating these tools has become essential in education in the 21st century (National Research Council, 2012; Ng et al., 2022). Numerous studies have examined different aspects of new technologies in education, such as their benefits in educational strategies and evaluation methods (Drigas & Ioannidou, 2012; Kazmi, Kamran, & Siddiqui, 2023) as well as the factors influencing the application of AI for students with autism (Elashram, 2023; Makari & Agwa, 2023; Nguyen, 2023), which provide valuable insights that can help educators, teachers, and researchers enhance teaching practices.

It has become evident that teachers' competency in using technologies and AI is a crucial skill. Competency, in this context, refers to a set of skills that teachers need to communicate and access relevant information through digital technologies, such as mobile devices, social media, applications and Internet platforms (Falloon, 2020; Ng et al., 2021; Takawira, 2024). However, in the context of technology and AI application in education, the literature may have overlooked teachers' competencies in the use of technology and AI application in inclusive classrooms. Various studies in this context focused on teachers' perceptions and attitude toward the use of technology and AI application. For instance, a study by Alsudairy and Eltantawy (2024) carried out an investigation into special education teachers' perception of using AI applications in teaching students with disabilities. They survey 301 male and females' special education teachers about their perception of using AI applications in teaching students

with disabilities. The result of their study showed teachers' perception were mostly neutral. Another study, using a mixed methods approach, sought to investigate primary school students and teachers' perception about AI application (ChatGPT) (Almohesh, 2024). The study utilized a questionnaire and semi-structured interviews, and the data was gathered from 250 students and five teachers. The study found that teachers recognized the value of AI in promoting inclusivity. Another recent study focused on investigating the relationship between teachers' digital competence and attitudes towards AI in education among 445 teachers. The study found that higher digital competence is associated with a more positive attitude towards AI (Galindo-Domínguez et al., 2024; Mazhair et al., 2023). Yet, despite these valuable contributions, there remains a notable gap in the literature in assessing teachers' competencies in using technology and AI applications in inclusive classrooms, and the variables influencing such competencies.

### Problem Statement and Research Questions

Despite various studies underscoring importance of technology and AI in education, concerns regarding the limited implementation of technology and AI applications in teaching have emerged (Hébert, Jenson, & Terzopoulos, 2021; Tallvid, 2016). Researchers have indicated that the initial step in technology acceptance and utilization is embedded in the attitude toward its utilization, which, when positive, supports the development of behavioral changes exhibited by greater motivation to adopt technologies. Several studies have focused on teachers' attitudes toward the use of AI applications in classrooms. Some studies have revealed that teachers have a positive attitude toward the use of AI in education (Chiu, 2021; Chiu & Chai, 2020) while others have found that they have a neutral level of perception of using AI in classrooms for students with disabilities (Alsudairy & Eltantawy, 2024). However, teachers continue to rely on traditional teaching methods (Hébert et al., 2021; Tallvid, 2016).

Studies have also suggested that teachers' ability to apply technology and AI applications is crucial for the success of inclusive education and that technical challenges can significantly hinder the quality of teachers' content delivery, instructional design and assessment methods (Seo et al., 2021; Torda, 2020). The findings of these studies highlighted the importance of exploring teachers' competencies in the utilization of technology and AI, which have received limited attention in the literature. Studies have only considered disciplines like teaching experience, level of teaching, type of disability, and specialty in analyzing teachers' competencies within the scope of AI and technologies in an inclusive education for students with disabilities. They have ignored assessment of teachers' competencies in using technologies and AI applications in inclusive classrooms. The current study would therefore fill up a research gap and would contribute to the existing literature, as it would help identify the areas of improvement to leverage the benefits of technologies and AI in education and increase its implementation.

This study aimed to assess teachers' competencies in implementing technologies and AI applications in inclusive classrooms by addressing the following research questions:

1. What is the level of teachers' competency in using technology and AI applications in inclusive classrooms?

2. Are there statistically significant differences in teachers' competencies in using technology and AI in inclusive classrooms based on their teaching experience, level of teaching, type of disability, and teaching specialty?

## Methodology

### Research Design

This study employed a quantitative survey research design to explore the phenomenon under investigation. It aimed to identify the level of teachers' competencies and the factors influencing their competencies in the use of technologies and AI applications in teaching. To achieve these objectives, a survey was used as the primary tool for data collection and analysis.

### Sampling Technique

A random sampling technique was applied in this study. The study sample comprised 100 teachers teaching inclusive classrooms for students with disabilities in 6 public elementary and secondary schools in Riyadh, Saudi Arabia. Table 1 shows the demographic characteristics of the participants.

**Table 1**

*Demographic Characteristics of the Participants (n=100)*

Variables	Categories	Frequency	Percentage
Teaching experience	5-10 years	19	19%
	10-15 years	25	25%
	More than 15 years	56	56%
Level of teaching	Elementary	80	80%
	Secondary	20	20%
Type of disability	Intellectual disability	39	39%
	Autism	36	36%
	Learning disability	25	25%
Specialty	General education teachers	76	76%
	Special education teachers	24	24%

### Data Collection and Research Procedure

After having informed the school principals about the objectives of the study, a survey using Google Forms was distributed digitally to about 480 teachers of six public elementary and secondary schools in Riyadh, Saudi Arabia. A digital survey owing to its distinct advantages, such as faster data collection and ease of answering questions, is much better than traditional face-to-face or pen-and-paper-based survey formats (Nayak & Narayan, 2019). The survey included detailed information about the study and its purpose to ensure that the participants were fully informed. Thus, informed consent was obtained from all participants. The survey contained 23 statements designed to measure teachers' competencies in using technology and AI applications with students with disabilities in

inclusive classrooms. Reminder messages were sent to the school principals on a weekly basis for 2 months, resulting in a total of 100 teachers finally participating in this study, accounting for 21% of the total population.

The survey was designed based on the study's objectives and questions and after reviewing the relevant literature (Elashram, 2023; Galindo-Domínguez et al., 2024; Nguyen, 2023; Ouyang & Jiao, 2021; Pedro et al., 2019; Salas-Pilco, Xiao, & Oshima, 2022). The survey was divided into three sections. The first section presented an overview of the study, outlining its objectives and instructions for completing the survey, and included a consent form detailing the participants' rights and the fact that the data would be used for research purposes. The second section of the survey collected demographic information about the study participants, such as the years of teaching experience, level of teaching, types of disability, and teachers' specialties. The third section consisted of 23 items categorized into two dimensions: Items 1-11 measured the competency in using technologies, and items 12-23 measured the competency in using AI applications. Response to each of the items was measured on a 6-point Likert scale, with options ranging from 6 = "strongly agree" to 1 = "strongly disagree." The ratings for the other four options were as follows: 5 = "agree," 4 = "somewhat agree," 3 = "somewhat disagree," and 2 = "disagree."

To measure the level of teachers' competencies in using technology and AI applications, the criteria for assessing teachers' competencies were developed using a legend scale. The scale rated the responses based on six levels, ranging from no competencies to the highest level of competencies as follows: less than 1.83 = no competencies, 1.84-2.66 = lowest, 2.67-3.49 = low, 3.50-4.32 = moderate, 4.33-5.16 = high, and 5.17-6 = the highest level of teachers' competency. The mean score was used to analyze the responses to each item in the survey.

Content validation was conducted by two academic faculty members to assess the validity of the scale that measured teachers' competencies in utilizing technologies and AI applications in inclusive classrooms. Faculty members provided feedback on the clarity of the items and instructions and reported that the items and instructions were clear. Considering the feedback and suggestions received, slight modifications were made to certain items, and the revised scale was subsequently returned to the faculty for a final review and confirmation. Faculty members indicated that the survey was appropriate for the research purpose.

The psychometric properties of the survey were confirmed by administering it to 70 teachers. These participants were excluded from the final sample ( $n=100$ ). Additionally, the coefficient alphas for competency in using technology and AI applications were calculated separately. Each demonstrated high reliability, with estimates of .923 for competency in using technologies and .977 for competency in using AI applications. These results indicated good reliability (George & Mallery, 2019), and the survey could be used as a valid and reliable tool for assessing competencies in implementing technologies and AI applications in inclusive classrooms. Next, the Pearson's correlation coefficient was calculated between the scores for each dimension. The Pearson's correlation coefficient scores for competencies in using technology and AI applications were .813 and .928, respectively. This reveals that both correlation values were statistically significant at the level of 0.01, which confirms the validity of the internal consistency of the survey.

### *Data Analysis*

To analyze the responses of the survey, the Statistical Package for the Social Sciences was used, assisted by multiple statistical techniques, including standard deviation and arithmetic means. Given the sample size, the study used nonparametric statistical analyses (Kruskal-Wallis and Mann-Whitney tests) for comparisons. The means and standard deviations were calculated to answer the first question. For the second question, the Kruskal-Wallis test was conducted to analyze the differences in teachers' competencies regarding the use of technologies and AI applications in inclusive classrooms, based on the teaching experience and type of disability. Furthermore, the Mann-Whitney test was performed to explore differences between special education teachers and general education teachers' competencies in using technologies and AI applications as well as to investigate the differences in those competencies between teachers teaching elementary- and secondary-level students. To ensure ethical and regulatory compliance, approval to conduct the study was obtained from the Ministry of Education in Saudi Arabia through the Education Policy Research Centre (No. 4500408383).

## **Results**

### *Teachers' Competencies in using Technologies and AI Applications*

To answer the first question regarding the level of teachers' competencies in using technologies and AI applications, arithmetic averages and standard deviations were calculated to analyze teachers' responses to each item on the questionnaire. [Table 2](#) shows the results for the first research question.

[Table 2](#) provides a detailed analysis of teachers' mean scores for their perceived competencies in using technologies and AI applications in inclusive classrooms. The average mean score for competencies in using technologies was  $M=4.7$ , corresponding to a high level of competency in using technologies while the average mean score for competencies in AI application was  $M=3.7$ , reflecting a moderate level of competency.

In terms of the competencies in using technologies, items 6, 7, and 8 exhibited the highest values, ranging from 5.19 to 5.25, indicating that, on average, teachers have the highest level of competency in content generation using Internet browsers to search for the content material they need, understand the material they teach, and access various sources of information on the content. By contrast, items 2 and 4 demonstrated moderate competency, with values ranging from 4.14 to 4.23. These items were specifically related to teachers' familiarity with technological applications for students with disabilities and their competencies in remotely evaluating their students. Regarding items 1, 3, 5, and 9-11, the teachers reported high levels of competencies in using technologies, with values ranging from 4.41 to 5.03. These items mainly related to the teachers' knowledge of the concepts and terminology of applications/programs that rely on technology in general and their ability to use technological means to teach remotely using digital platforms to enrich students' knowledge, such as the national education platforms Ain and Madrasati. In terms of the competencies in using the AI application, the results indicated that items 12-23 demonstrated moderate competency levels, with values ranging from 3.58 to 3.84.

**Table 2***Teachers' Level of Competencies in Using Technologies and AI Applications*

No	Items	M	SD	Level
<b>Dimensions of competencies in using technologies</b>				
1	I know the concepts and terminology of technology-based applications/programs in general	4.41	1.303	High
2	I am familiar with the technological tools or applications that are used in teaching students with disabilities	4.14	1.407	Moderate
3	I can use technological means to teach all students remotely	4.36	1.411	High
4	I can use technological programs or applications to evaluate all students remotely and provide them with feedback	4.23	1.377	Moderate
5	I can use digital platforms to enrich students' knowledge, for example, Ain and Madrasati platforms	4.74	1.323	High
6	I can use Internet browsers to search for the scientific material when I need them	5.19	1.253	Highest
7	I can use Internet browsers to understand the content of the scientific subject while I teach	5.25	1.158	Highest
8	I can use Internet browsers to search for sources of information to provide students with various sources of knowledge	5.20	1.101	Highest
9	I can use appropriate techniques and AI programs while explaining the scientific material to students	5.03	1.167	High
10	I can employ technological programs and applications in preparing lesson plans	4.72	1.256	High
11	I can solve the problems or challenges that I face while using technological means	4.45	1.258	High
<b>Dimensions of competencies in using AI applications</b>				
12	I have knowledge of the concepts and terminology associated with AI	3.66	1.458	Moderate
13	I know how to use basic AI-based tools and techniques with students with disabilities	3.64	1.528	Moderate
14	I can choose appropriate AI-based technologies while teaching students with disabilities	3.81	1.502	Moderate
15	I am familiar with AI-based technologies and their technical uses in general	3.61	1.556	Moderate
16	I know how to perform tasks using AI-based tools with students with disabilities	3.58	1.590	Moderate
17	I can apply AI-based tools to enhance classroom engagement and active learning for students	3.69	1.535	Moderate
18	I can use AI tools to prepare plans for students with disabilities to further research and understand the content of the scientific subject during teaching	3.77	1.543	Moderate
19	I can use AI techniques while explaining the lesson to enhance the motivation of students with disabilities, attract their attention, arouse their interest and interaction, follow up on the lessons, and increase their adaptation	3.75	1.553	Moderate
20	I can use AI-based tools and various teaching strategies to embed and deepen scientific material for all students	3.84	1.536	Moderate
21	I can employ AI techniques while explaining the content, which helps in forming coherent and connected ideas for students with disabilities	3.75	1.566	Moderate
22	I can use AI-based techniques to consider the individual differences of all students	3.78	1.548	Moderate
23	I can use some AI applications as well as other strategies to reduce disruptive behaviors	3.79	1.526	Moderate

### *Demographic Comparisons of Teachers*

To address the second research question regarding whether there are statistically significant differences in teachers' competencies in using technologies and AI applications in inclusive classrooms based on the proposed variables, two nonparametric statistical tests were performed. The Kruskal-Wallis test was conducted to determine whether there were significant differences in teachers' competencies based on the number of years of experience and type of disability. Additionally, the Mann-Whitney U test was conducted to explore the differences in teachers' competencies based on teaching specialty and level of teaching.

#### *Teaching Experience*

In this study, participants were compared based on their experience in teaching students with disabilities. Teachers' years of experience were categorized into three groups (5-10, 10-15, and >15 years). To determine whether there were significant differences in teachers' competencies based on the number of years of experience, the Kruskal-Wallis test was conducted. A comparison across the teaching experience groups revealed no statistically significant differences in teachers' competencies based on their teaching experience. The Kruskal-Wallis value of competencies in using technologies was .895, with a significance level ( $p$ -value) of .639, which is above the conventional threshold of 0.05, while the Kruskal-Wallis value of competencies in using AI was 2.476, with a significance level ( $p$ -value) of .290, which is above the conventional threshold of 0.05. Hence, the number of years of teaching experience did not significantly affect the teachers' competencies in using technology and AI applications in inclusive classrooms.

#### *Type of Disability*

Teachers' responses were compared based on the types of students with disabilities that they had taught. To determine whether the type of disability had any significant effect on teachers' competencies in using technologies and AI applications in inclusive classrooms, the Kruskal-Wallis test was conducted. Regarding the competencies in using technologies, the Kruskal-Wallis value was .978, with a significance level ( $p$ -value) of .613, which was above the conventional threshold of 0.05, while the Kruskal-Wallis value of competencies in using AI was .102 with a significance level ( $p$ -value) of .950, which was again above the conventional threshold of 0.05. This indicates that there was no statistically significant difference in teachers' competencies based on the disability type. Therefore, whether the disability is an intellectual disability, an autism spectrum disorder, or a learning disability, it does not significantly impact teachers' competencies in using technologies and AI applications in inclusive classrooms.

#### *Level of Teaching*

This study compared teachers teaching elementary and secondary level students to determine whether the level of teaching had any significant effect on teachers' competencies in using technologies and AI applications in inclusive classrooms. Hence, the Mann-Whitney U test was conducted. The results indicated that the  $Z$  value of competencies in using technologies was -.617, with a significance level ( $p$ -value) of .537, which was above the conventional threshold of 0.05. Meanwhile, the  $Z$  value of

competencies in using AI was -1.768, with a significance level ( $p$ -value) of .077, which was above the conventional threshold of 0.05. This result indicates that there is no statistically significant difference in teachers' competencies in using technologies and AI applications between teaching elementary- and secondary-level students.

#### *Teachers' Specialty*

Table 3 displays the results from the Mann-Whitney test comparing special education and general education teachers based on their competencies in using technologies and AI applications to determine whether such specialty has any significant effect on their competencies. In their competencies of using technologies, special education teachers showed a higher mean rank (53.48) compared with general education teachers (41.06). The  $Z$  value of competencies in using technologies was -2.505, with a significance level ( $p$ -value) of .012, indicating a statistically significant difference between the two groups, with special education teachers showing higher competencies in using technologies. Regarding competencies in using AI, the result indicated that the  $Z$  value was -1.054 with a significance level ( $p$ -value) of .292, which is above the conventional threshold of 0.05. This result concludes that there is no statistically significant difference between special education teachers and general education teachers in their competencies of using AI applications.

**Table 3**

*Results of the Mann-Whitney Test for Teachers' Competencies in Using Technologies and AI Applications According to Specialty*

Dimension	Specialty	N	Mean Rank	Sum of Ranks	Z	Sig
Competencies in using technologies	Special education teachers	76	53.48	4064.50	-2.505	.012
	General education teachers	24	41.06	985.50		
Competencies in using AI	Special education teachers	76	54.58	4148.00	-1.054	.292
	General education teachers	24	37.58	902.00		
Total	Special education teachers	76	52.22	3968.50	-1.828	.067
	General education teachers	24	45.06	1081.50		

### **Discussion**

The study examined the level of teachers' competency in using technologies and AI in inclusive classrooms and compared teachers' competencies based on several variables, including years of teaching experience, type of disability, and levels of teaching and teaching specialty. Findings indicated that the participants had a high level of competency in using technologies in inclusive classrooms. This result can be attributed to the recent experiences gained during the coronavirus disease 2019 pandemic, when schools in Saudi Arabia operated virtually. During this period, teachers in Saudi Arabia were trained to use various digital platforms and prepare online tests and assessments (Alghamdi, 2022). These workshops and training courses positively contributed to the teachers' levels of competency in using technology. This aligns with a study highlighting that one of the key challenges teachers' faces in applying technology, such as assistive technology, is the limited availability of trainings and workshops (Fernández-Batanero et al., 2022).

The current study also reinforces the significance of training and workshops to enhance teachers' competencies in integrating technology into their practices. However, the findings also revealed that teachers may not be fully proficient in the use of AI applications for students with disabilities and in evaluating all students remotely, suggesting room for improvement. Thus, a higher number of targeted workshops and training can be administered to improve their competencies in those areas. Teachers should not only possess the knowledge and skills necessary to utilize AI and technologies to meet the needs of students (Morrison et al., 2017), but also keep pace with the rapid development of AI applications, thereby enhancing students' abilities, talents, and creativity (Manyika et al., 2017).

The positive impact of training programs, as evidenced by the Saudi government push mentioned previously, was also supported by a study indicating that teachers' competencies can be enhanced through training programs (Alsamiri, 2024). However, some researchers may argue that dedicated training could support the spread of information but may not necessarily result in using that information (Morrier, Hess, & Heflin, 2011). Another factor explaining the high level of competency in technology could be attributed to the fact that the Internet penetration in Saudi Arabia reaches around 99% of the total population, according to a report by the Communication Space Technology Commission (CSTC, 2023). With nearly universal access to the Internet and high daily usage rates, it is plausible that teachers have developed strong skills in navigating and leveraging online resources for their educational practices. This can explain teachers' highest level of competency in content generation using Internet browsers to search for the content material they need and access various sources of information on the content. Thus, having appropriate technological infrastructure can foster a high level of competency in using technology.

Teachers reported a moderate level of competency in using AI applications, a finding that is likely explained by the novelty of AI as a concept and its implementation in Saudi Arabia. Additionally, teachers' level of competency in using AI can be associated with teachers' attitude toward AI (Galindo-Domínguez et al., 2024). Domingues et al.'s study revealed that teachers' higher digital competence is associated with high levels of willingness to apply AI and a more positive attitude toward AI. In light of this association, the observed moderate competency in AI application in the present study can be associated with teachers' neutral perception of using AI in classrooms, as found in a recent study conducted in Saudi Arabia (Alsudairy & Eltantawy, 2024). Another explanation may be that teachers are concerned about AI's ability to perform tasks without errors and the effort required to learn how to utilize it effectively (Galindo-Domínguez et al., 2024).

Contrary to findings from previous studies (Al Darayseh, 2023; Demaidi, 2023; Galindo-Domínguez et al., 2024; Hyatt & Owenz, 2024) that showed that teachers' experience influences technology integration, the current study revealed no significant difference in teachers' competency levels in using technologies and AI based on their years of experience. This aligns with more recent research (Bebell, Russell, & O'Dwyer, 2004; Galindo-Domínguez et al., 2024) indicating that teachers' experiences may not be a primary determinant of technology adoption. Bebell et al. (2004) demonstrated that competency and attitude toward AI in education remained consistent regardless of the teaching experience, suggesting that a positive disposition toward AI is a stronger factor in determining teachers' competency than years of experience. This suggests that a positive attitude is a

catalyst for technology adoption and higher competency and may be more influential in shaping teachers' perceptions of their technological capabilities than their work experience.

An analysis of teachers' competencies in technology and AI based on specific disability types revealed no significant differences. Therefore, whether the disability is an intellectual disability, an autism spectrum disorder, or a learning disability, it does not significantly impact teachers' competencies in using technologies and AI applications in inclusive classrooms. This suggests that teaching methods may be comprehensive in addressing the needs of all students. Thus, teachers may perceive their competencies in AI as applicable to all students without differentiating among them. This finding can be linked to the perspective of inclusive pedagogy, which recognizes that students with disabilities do not require teaching that is different from or additional to any other group of learners (Florian, 2007), and pedagogy that is believed to be specific to a group of students with disabilities is often appropriate for application to other learners (Florian et al., 2004).

A comparison between teachers teaching elementary and secondary level students revealed no significant differences in competencies in using technology and AI applications in inclusive classrooms. Thus, teachers may use similar approaches to technology and implement AI in their classrooms, regardless of the grade level. This could be explained by the fact that teachers at both the elementary and secondary levels received similar training in technology during the pandemic. A significant disparity in technology competencies emerged when special and general education teachers were compared, with the former group showing higher competencies in using technology. This discrepancy is logical, as it could be attributed to special education teachers having more knowledge of technology and its value and benefits for students with disabilities. Consequently, special education teachers are more likely to integrate technology into their own instruction. These findings align with those of previous studies that emphasized the crucial role of teacher knowledge in technology (Manyika et al., 2017). Furthermore, beliefs about technological value are associated with its integration into the educational field Taimalu and Luik (2019). Competencies in using AI for the same groups revealed no significant differences, which could be explained by the fact that AI is a relatively new concept and is less implemented; hence, teachers face similar challenges regardless of their specialty.

### **Conclusion, Limitations, Future Research and Implications**

This study aimed to assess the level of teachers' competency in using technologies and AI in inclusive classrooms, and it compared these competencies based on several variables, including years of teaching experience, type of disability, levels of teaching, and teaching specialty. Findings revealed that the participants had a high level of competency in using technologies and a moderate level of competency in using AI applications in inclusive classrooms. This result may be explained by the Saudi government's national push toward digitalization, which was reflected in the workshops and training provided to teachers during the pandemic. However, the study data suggests room for improvement, as teachers are still not fully proficient in using AI applications for students with disabilities and in their competencies in evaluating students remotely. Thus, a higher number of workshops and training programs should be conducted to improve teachers' competencies in using AI applications. Furthermore, a significant disparity in technological competencies emerged when special and general education teachers were compared, with the former

group showing higher competencies in using technologies. By contrast, the other variables (teaching experience, type of disability, and level of teaching) did not impact teachers' competencies in using technologies and AI applications in inclusive classrooms.

Earlier studies have measured teachers' attitudes toward the use of new technology in classrooms, relationship between teachers' digital competence and attitudes towards AI in education, and applications tools to support the needs of students with disabilities. Yet, there has been a notable gap in the literature on assessing teachers' competencies in using technology and AI applications, the variables influencing such competencies, and the specific application of these competencies in inclusive classrooms. This study attempted to fill this research gap by assessing the level of teachers' competency in using technologies and AI in inclusive classrooms. It also compared these competencies based on several variables, including years of teaching experience, type of disability, levels of teaching, and teaching specialty. The results of this study contribute to the extant literature on technologies and AI applications in inclusive classrooms, specifically in the Saudi Arabian context.

Certain limitations may have influenced the study's outcomes. The sample size was 100 participants drawn from 6 public schools in Riyadh, which limits the generalizability of the findings. Additionally, the study considered the following specific variables: years of teaching experience, type of disability, teaching level, and specialty. Future studies should include different variables and expand the sample size and geography to provide more comprehensive insights. Moreover, the results of the study are based on self-report using a survey to measure teachers' competency in using technologies and AI in inclusive classrooms, with the assumption that it translates into practice; however, having high competency may not necessarily translate into practice. Thus, it is vital that future research measures how technologies and AI competencies translate into practical teaching practices and collaborative learning in inclusive classrooms. Qualitative methods, such as observation, can provide a deeper understanding of this phenomenon. It would help understand barriers and challenges teachers' face and allow for the development of more targeted strategies to enhance inclusion and accessibility to all students. This study offers evidence indicating the importance for teachers to enhance their competencies in AI applications. A result that could inform officials in education to focus on conducting workshops and training programs for teachers to promote their competency in using AI applications to teach students with disabilities in inclusive classroom.

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