International Journal of Innovative Research and Scientific Studies, 8(4) 2025, pages: 1270-1281

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

A proposed vision for the use of artificial intelligence in education by teachers of students with intellectual disabilities

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Abstract

The study aimed to identify the attitudes of teachers of students with Intellectual Disabilities (ID) towards the use of Artificial Intelligence (AI) applications in education and its obstacles, with the presentation of a proposed vision for the use of these applications in education. The study sample consisted of teachers of students with ID in the primary stage in Al-Ahsa, numbering 179 male and female teachers. The study used a descriptive analytical approach, which was represented in the design of the study tool (questionnaire). The results of the study showed a low degree of negative attitudes among teachers of students with ID towards the use of AI in education with their students, and a high degree of obstacles to its use in education with these students. Based on the results, the researchers prepared and designed the proposed vision for the use of AI applications in education by teachers of students with ID.

Keywords: Assistive technology, Attitudes, Challenges, Digital learning, Saudi Arabia.

DOI: 10.53894/ijirss.v8i4.8055
Funding: The research was supported by the Deanship of Scientific Research at King Faisal University, Al-Ahsa, Saudi Arabia, as part of the annual research project (Grant Number: KFU252189).
History: Received: 30 April 2025 / **Revised:** 3 June 2025 / **Accepted:** 5 June 2025 / **Published:** 24 June 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Both authors contributed equally to the conception and design of the study. Both authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Institutional Review Board Statement: The Ethical Committee of King Faisal University, Saudi Arabia has granted approval for this study (Ref. No. KFU-REC-2024-JUN-ETHICS1893).
Publisher: Innovative Research Publishing

1. Introduction

There has been a growing interest in educating all students and meeting their educational needs recently. This has been reinforced by the use of technology as a means of overcoming barriers to learning. Innovative educational technologies have begun to open new ways to interact with learners and increase their access to education. The most prominent of these are those based on Artificial Intelligence (AI), which is defined as the ability of a machine to simulate intelligent human behavior, for example, speech recognition, visual perception, learning, and analysis [1-3]. In recent years, its use in educational settings

has increased, with the promotion of Artificial Intelligence in Education (AIEd) and its technologies' roles in personalizing learning, increasing the effectiveness of the environment, and guiding teachers and learners through teaching and learning activities, while increasing interaction in the classroom [4]. This underscores the importance of its application in educational settings, as teaching and learning activities become more effective and specific to the field of special education [5].

Special education is an area where AI has been applied, and its importance, positive impacts, and potential to solve numerous problems have been praised [6-8]. A World Health Organization report emphasized that developments in AI can contribute to the development of the education and learning sector, empower students with disabilities in education, protect their independence, enhance their well-being, safety, and the public interest, promote responsibility and accountability, and ensure inclusion and equity [9, 10]. The results of some studies also concluded the importance of integrating its applications into the education and teaching of students with disabilities [11-15] and indicated its role in implementing a variety of strategies in the teaching process [16] and personalizing learning [7] and improving effectiveness in educational settings by supporting students' autonomy in learning, in addition to supporting teachers while guiding students with disabilities in particular [6]. The use of AI has empowered students with disabilities by providing educational tools that have helped dyslexics learn [17]. AI has also helped individuals with disabilities use mobile applications, for example, [18]. It has also been involved in the development of a socially assistive robot [19]. It has also helped individuals with visual impairments navigate [20] and has provided systems to overcome speech recognition problems [3].

In addition, AI specifically supports individuals with ID, who have clear and substantial limitations in both intellectual functioning and adaptive behavior, including social, daily living, and practical skills, that arise before the age of 22 years [21]. AI positively impacts independent living and quality of life support for individuals with ID [22, 23] and the development of intervention programs to improve their social skills [24] in addition to improving their participation in activities designed according to personal needs and emotional state [25].

Some studies have addressed the use of artificial intelligence (AI) with individuals with ID. Almufareh et al. [26] study confirmed its potential to improve disability diagnosis, enhance their quality of life, and achieve a more inclusive and accessible society. The results demonstrated the potential for individuals with ID to benefit from AI technology in several ways, including increasing independence in their daily lives, as AI-powered home assistants can help individuals with ID manage their homes without the need for mobility, and improving communication for people with ID. A systematic review by Montoya-Rodríguez et al. [24] analyzed virtual reality and augmented reality programs designed to enhance the development of social skills for individuals with ID from 2005 to 2020. It found some scientific evidence indicating the usefulness of VR and AR in developing intervention programs to improve the social skills of these individuals.

Furthermore, AI supports individuals with ID in education [25]. Aimed in their study to evaluate the effectiveness of the Adaptive Learning System MaTHiSiS as a means of maximizing engagement and learning among 67 children with ID aged 6 to 18 years. The results showed significantly greater engagement and less boredom in the intervention compared to control sessions. In addition, engagement increases when activities are designed according to the learner's personal needs and emotional state, and the system enhances emotional states that, in turn, enhance learning. The review by Barua et al. also indicated that [6] aimed to summarize the scope and effectiveness of AI-powered tools developed using machine learning models to address the learning challenges of students with unspecified disorders (including students with ID). The review summarized evidence suggesting the successful use of AI tools to improve social interaction and supportive learning between 2011 and 2021. The results showed that AI-powered tools have demonstrated positive effects on student learning and are well-received by teachers, parents, special educators, and therapists, and can be implemented in their educational or therapeutic practices. The review emphasized the need to develop future AI tools, with a focus on providing personalized learning for these students.

The results of the study by Fakhro and Ahmed [27] which aimed to verify the effectiveness of an artificial intelligence-based training program in improving the cognitive skills of ten students with mild intellectual disabilities in government integration centers, revealed statistically significant differences between the pre- and post-tests of the experimental group in favor of the post-test on the cognitive skills test. The study also found statistically significant differences between the control and experimental groups in the post-test of the cognitive skills test in favor of the experimental group. Meanwhile, the study by Makari and Ajwa [11] aimed to reveal the reality and challenges of employing AI applications in the rehabilitation of children with disabilities (Autism Spectrum Disorder (ASD) - ID) from the perspective of teachers and specialists, as well as to reveal teachers' attitudes toward employing AI applications in the rehabilitation of children with disabilities in schools and centers for people with disabilities. The study concluded that the reality of employing AI applications by teachers with ASD and ID was moderate. The challenges facing the employment of AI applications were ranked as follows: (material and technical challenges, challenges in the educational and teaching field, challenges in the security and privacy aspect, challenges in the social field). All challenges were highly significant. Regarding the attitudes of teachers and specialists, they were positive and, to a large extent, also towards the importance of employing AI applications in the educational and rehabilitation process for children with ASD and ID. The study also concluded that there were no statistically significant differences in the reality of employing AI applications, their challenges, and teachers' attitudes, due to the variables of specialization (ID, ASD), years of experience, and gender.

By reviewing previous studies, it becomes clear that the results of some studies confirm the importance of integrating artificial intelligence applications into education and teaching for people with disabilities in general, such as Barua et al. [13], Makari and Ajwa [11], Han et al. [15], Bressane et al. [14] and for people with ID specifically, such as the study of Standen et al. [25]; Almufareh et al. [26] Fakhro and Ahmed [27] and Montoya-Rodríguez et al. [24] however, there are limited research studies in the current literature on the use of artificial intelligence in the field of special education [28] and a scarcity of studies related to the use of artificial intelligence with individuals with ID in particular, despite its effectiveness, as the

focus is on autism spectrum disorder [5, 13] which shows the need to provide more attention and study in the field of artificial intelligence, and to study teachers' attitudes towards it and its impact on the education of their students with ID, which is considered one of the main goals of educational institutions.

Locally, investing in AI in the education sector in general is considered one of the most prominent goals of the Kingdom of Saudi Arabia's Vision 2030 [29]. However, AI applications in the Kingdom are still in their infancy, especially in the field of educating students with disabilities. Teachers have identified many challenges facing the use of AI in the educational and rehabilitation process for children with ID [11]. The researchers also noted, through their work as university faculty members and through their experience in field training with students with ID, the shortcomings in the use of modern educational methods, and the reliance on methods that may not be appropriate for their needs and do not improve their educational outcomes.

There is also a dearth of local studies that in-depth examine the use of AI applications in the education of students with ID. Most previous studies have focused on the Western context, which certainly differs in its circumstances and variables from the Saudi context. This underscores the need to conduct research and study teachers' attitudes toward the use of AI applications in education, specifically in the field of intellectual disability, in line with the local context. This will address a research gap and contribute to the existing body of literature. Furthermore, identifying the trends and obstacles that affect its use from the teachers' perspective will help build a proposed vision that supports its use with their students. It will also provide insights for decision-makers in developing legislation, laws, and appropriate support within schools to support students with ID. This could serve as a reference in the field of AI use and in meeting the diverse needs of these students.

Furthermore, the results of this study may contribute to achieving the development goals of the Kingdom of Saudi Arabia's Vision 2030, which focuses on investing in artificial intelligence in the education sector. The information from this study may also help guide leaders and supervisors in planning and developing the professional skills of teachers of students with ID. This can be achieved through training and providing resources to support the use of artificial intelligence with their students and meet their needs, thus contributing to the development of the educational process. Based on this, and given the importance of the primary stage for these students in providing them with appropriate knowledge and skills in this area, and the scarcity of studies on artificial intelligence in the Arab world to the best of the researchers' knowledge this study sheds light on the attitudes of primary school teachers toward using artificial intelligence with their students with ID and the obstacles to its use, while offering a proposed vision for its use in education. Accordingly, the study attempts to answer the following questions:

1. What are the attitudes of teachers of students with ID toward the use of artificial intelligence applications in education within intellectual education programs?
2. What are the obstacles to teachers of students with ID using artificial intelligence applications in education within intellectual education programs?
3. What is the proposed vision for teachers of students with ID to use artificial intelligence applications in education within intellectual education programs?

2. Methods and Procedures

2.1. Methodology

The current study followed a descriptive-analytical approach within its known limits, as it was appropriate for the study's objectives. This approach identified the reality of the use of AI in education by teachers of students with ID in Al-Ahsa Governorate, Kingdom of Saudi Arabia, and identified the obstacles to its use. A proposed vision for these teachers' use of AI in education was developed, in light of their actual use.

2.2 Study Population:

The current study population consisted of all male and female teachers of students with ID, totaling 271 teachers in the primary stage in Al-Ahsa Governorate for the academic year 2024.

2.3. Participants

The primary study sample consisted of 179 male and female teachers of students with ID in the primary stage in Al-Ahsa Governorate for the academic year 2024. They represent 66% of the population, comprising 85 male and female teachers and 94 female teachers with varying years of experience. They were selected using a simple random sampling method. The following table illustrates the characteristics of the study sample.

Table 1.
Characteristics of the study sample.

Experiences	Males	Females	Sum
Less than 5 years	20	17	37
Between 5–10 years	34	34	68
More than 10 years	40	34	74
Sum	94	85	179

3.4. Procedures

The researchers developed a questionnaire to measure the extent to which teachers of students with intellectual disabilities (ID) utilize artificial intelligence in the educational process for their students. This aimed to answer the study's questions. The questionnaire comprised two main dimensions: attitudes toward the use of artificial intelligence applications in education and barriers to their use. It was designed using a three-point Likert scale (agree, somewhat agree, disagree), with "agree" receiving three points, "somewhat agree" two points, and "disagree" one point. In its final form, the questionnaire included 20 statements distributed across the two main dimensions, with each dimension containing 10 statements. *Questionnaire Preparation Steps*: The researchers prepared a questionnaire on the reality of intellectual education teachers' use of artificial intelligence in education. The final version of the questionnaire contained 20 items divided into two main dimensions: attitudes toward the use of artificial intelligence applications in education and obstacles to their use, with ten items for each dimension. In preparing the questionnaire, the researchers relied on the following steps:

3.4.1. Questionnaire Construction Steps

1. Reviewing the literature and theoretical heritage related to the inclusion of intellectual education, teachers' use of artificial intelligence in education to define its operational concept, its sub-dimensions, and the paragraphs included in the questionnaire used in the current study.
2. Reviewing a set of studies and measures specific to the use of artificial intelligence in education by intellectual education teachers and teachers in general. To be used in developing current questionnaires, such as the questionnaire on the reality of using artificial intelligence applications in special education schools [27].
3. Determine the operational definitions of the questionnaire and its sub-dimensions.
4. Identify and formulate paragraphs for each dimension separately in simple, clear phrases appropriate to the study sample, and create a preliminary version of the questionnaire.
5. Determine the necessary data and instructions for the sample members (male and female teachers) to write on the first page of the questionnaire. Each individual should place a check mark in front of each statement in one of the three columns corresponding to the statement (agree, somewhat agree, or disagree). Agree receives three marks, somewhat agrees two marks, and disagrees one mark.
6. The questionnaire was administered to a pilot sample of intellectual education teachers from the same study community to determine its validity and reliability.

Calculating the Validity and Reliability of the Questionnaire: The questionnaire was administered in its initial form to a pilot sample of 48 male and female intellectual education teachers in Al-Ahsa Governorate from the same study community to determine its validity and reliability.

Validity of the Questionnaire: The validity of the questionnaire was calculated using two methods: internal consistency and concurrent validity (criterion validity).

First, internal consistency: The researchers calculated the internal consistency coefficients of the questionnaire by determining the binary correlation coefficient between the score of each statement within each dimension and the total score of that dimension, as well as between the score of each dimension and the total score of the questionnaire. The following Table 2 explains the internal consistency coefficients of the questionnaire used in the research**:**

Table 2.
Internal consistency of questionnaire items and dimensions (n=48).

Attitudes	Consistency Coefficient	Barriers	Consistency Coefficient
1	0.435**	11	0.492**
2	0.646**	12	0.593**
3	0.730**	13	0.682**
4	0.739**	14	0.580**
5	0.804**	15	0.559**
6	0.741**	16	0.741**
7	0.729**	17	0.676**
8	0.685**	18	0.473**
9	0.695**	19	0.736**
10	0.738**	20	0.782**

Note: ** Functional at level (0.01) * Functional at level (0.05).

Table 2 shows that all correlation coefficients of each statement with the dimension to which it belongs are statistically significant at the 0.01 level. It is also clear from Table 2 that all correlation coefficients of the questionnaire dimensions with the total score are statistically significant at the 0.01 level, which makes us trust the validity of the questionnaire statements and its main dimensions. Therefore, the number of questionnaire paragraphs in its final form comprised 20 statements distributed over two dimensions, such that each dimension contained 10 statements.

The researchers also calculated the concurrent validity (criterion validity) for the questionnaire. They calculated the correlation coefficient between the scores of the exploratory sample members, 48 male and female intellectual education teachers from the same research community, on the current questionnaire and their scores on the questionnaire on the reality of using AI applications in intellectual education programmes [12]. The value of the correlation coefficient between the scores of the exploratory sample members on the two questionnaires was 0.564. The correlation of the scores of the

dimensions of the current questionnaire with the total score of the questionnaire remains significant [12]. They were 0.408 and 0.465, respectively. All are significant at the 0.01 level, which makes us confident in the questionnaire's validity

3.5. Reliability

The researchers relied on two methods to calculate the reliability coefficient of the questionnaire: Cronbach's alpha and the split-half (Spearman-Brown). Table 3 shows the reliability of the dimensions of the questionnaire and its total score using the split-half methods (Spearman-Brown) and Cronbach's alpha.

Table 3.
Reliability of the dimensions of the questionnaire and its total score using the split-half methods (Spearman-Brown) and Cronbach's alpha (n=48).

Dimensions	Number of paragraphs	Reliability coefficient (Cronbach's alpha)	Reliability coefficient (Spearman-Brown)
Attitudes	10	0.915	0.763
Barriers	10	0.890	0.857
Total score of the questionnaire	20	0.887	0.731

It is clear from Table 3 that all the stability coefficients of the questionnaire dimensions and their total score, as measured by the Cronbach's alpha and split-half (Spearman-Brown) methods, are high. Notably, the stability coefficients ranged between 0.887 and 0.915 by the Cronbach's alpha method, while using the split-half method, they ranged between 0.731 and 0.857, which increases our confidence in the questionnaire's stability. Table 4 shows the relative weight of the three-point Likert scale.

Table 4.
Relative weight of the three-point Likert scale.

Relative weight of sample responses on a three-point Likert scale	
Relative weight	**Level**
1: 66	Low
1.67: 2.33	Medium
2.34: 3	High

3.6. Procedural Steps of the Study

In preparing the current study, the researchers relied on a set of procedural steps, which can be summarized as follows:

1. Reviewing Arab and foreign references and studies that addressed the study variables to gather scientific material related to the study's concepts and build its theoretical framework.
2. A questionnaire was designed to examine the attitudes and obstacles to the use of artificial intelligence by teachers in intellectual education, and its procedural definitions were determined.
3. The validity and reliability of the questionnaire scale were calculated by applying it to a survey sample from the same study population.
4. The primary study sample was identified from elementary intellectual education teachers in Al-Ahsa Governorate, Saudi Arabia, for the academic year 2024.
5. The questionnaire was administered to the study sample members in the second semester of the academic year 2024, after obtaining approval from King Faisal University, represented by the Scientific Research Ethics Committee, to conduct the research, and approval from the Ministry of Education, represented by the Al-Ahsa Education Department. Teachers were informed of the purpose of the study, confidentiality policies, and the data collection period before completing the questionnaire. In addition, consent was obtained from each participant.
6. Quantitative data were then obtained, entered into specific tables, and processed statistically.
7. After processing the data statistically, the results were interpreted and discussed in light of the theoretical framework of the current study and previous studies.
8. In light of the researchers' findings, a proposed vision for the use of artificial intelligence in education by intellectual education teachers was developed.

3.7. Data Analysis

The analysis was carried out using several statistical methods, including the internal consistency method to calculate the validity of the questionnaire; the split-half method (Spearman-Brown equation), and Cronbach's alpha coefficient to verify the stability of the questionnaire; frequencies, percentages, and arithmetic means to determine the extent of AI use by teachers in intellectual education.

4. Results

4.1. Degree of Attitudes of Teachers of Students with ID Toward the use of Artificial Intelligence Applications in Education

The researchers used frequencies, percentages, and averages to identify the degree of teachers' attitudes toward the use of artificial intelligence applications in education for students with ID, which Table 5 illustrates.

Table 5.
Frequencies, percentages and averages to identify the degree of attitudes of teachers of students with ID toward the use of artificial intelligence applications in education.

Vocabulary	Disagree		Somewhat Agree		Agree		Relative Mean	Ranking
	Frequencies	%	Frequencies	%	Frequencies	%		
I am afraid of using AI applications in teaching students with intellectual disabilities.	102	57.0	55	30.7	22	12.3	1.553	3
I think that teaching with AI applications to my students with ID might cause me stress and fatigue.	75	41.9	83	46.4	21	11.7	1.698	1
I find the use of AI applications in education for students with ID a frustrating idea.	122	68.2	40	22.3	17	9.5	1.413	8
I am not enthusiastic about using AI applications in education with my students with ID.	113	63.1	46	25.7	20	11.2	1.480	4
I think that starting to use AI applications is a negative thing.	127	70.9	43	24.1	9	5.0	1.340	10
I believe my performance in teaching using AI applications with my students with ID will be weak.	112	62.6	60	33.5	7	3.9	1.413	8
I believe that my teaching performance using AI applications will not benefit the students.	117	65.4	47	26.3	15	8.4	1.430	6
I believe that the educational outcomes of using AI applications will be weak.	116	64.8	43	24.0	20	11.2	1.463	5
Show colleagues, parents, and students negative views about AI applications in education.	99	55.3	54	30.2	26	14.5	1.592	2
I oppose the idea of using AI applications within the educational process with students with ID.	131	73.2	19	10.6	29	16.2	1.430	6
							1.481	Low

The previous Table 5 shows the negative attitudes of teachers of students with ID towards the use of AI applications in education. The ranking of the top three paragraphs according to teachers' attitudes is as follows: The paragraph: "I believe that teaching using AI applications with my students with ID may cause me stress and fatigue" came in first place with an average of 1.698, while the paragraph: "I show colleagues, parents, and students negative opinions about AI applications in education" came in second place with an average of 1.592, and the paragraph: "I feel afraid of using AI applications in

teaching with students with ID" came in third place with an average of 1.553. The previous table also shows that the overall average of teachers' negative attitudes towards the use of AI in education is 1.481, which is a weak (small) value less than 1.66, indicating the presence of largely positive attitudes among intellectual education teachers towards the use of AI in education.

4.2. Degree of Barriers to Teachers of Students with ID Using AI Applications in Education

The researchers used frequencies, percentages and averages to identify the degree of barriers to teachers of students with ID using AI applications in education, which Table 6 illustrates.

Table 6.
Frequencies, percentages and averages to identify the degree of barriers to teachers of students with ID using AI applications in education.

Vocabulary	Disagree		somewhat agree		Agree		Relative mean	Ranking
	frequencies	%	frequencies	%	frequencies	%		
Negative attitudes and expectations towards the use of AI applications by teachers in schools.	32	17.9	94	52.5	53	29.6	2.117	8
Lack of access to AI educational applications for students with ID.	11	6.1	76	42.5	92	51.4	2.452	6
Teachers' lack of experience in using AI applications in the educational field.	11	6.1	88	49.2	80	44.7	2.385	7
The belief that using AI applications in teaching people with ID requires more effort than traditional teaching methods.	36	20.1	94	52.5	49	27.4	2.072	9
The lack of technical support required to incorporate AI applications into the education of people with ID.	9	5.0	74	41.3	96	53.7	2.486	3
Lack of awareness among some teachers of the importance of using AI applications in education for students with ID.	9	5.0	75	41.9	95	53.1	2.480	4
The inability of students and their parents to solve problems they encounter when using AI applications in education.	14	7.8	68	38.0	97	54.2	2.463	5
Poor response of students with ID to and interaction with AI applications in their education.	55	30.7	82	45.8	42	23.5	1.927	10
Lack of adequate training programs for teachers to use AI applications in education.	6	3.4	73	40.8	100	55.8	2.525	2
The lack of adequate training programs for students with ID and their parents on the use of AI applications in education.	8	4.5	54	30.2	117	65.3	2.608	1
							2.351	High

It is clear from the previous Table 6 which shows the obstacles to the use of AI applications in education by teachers of students with ID, where the ranking of the top three obstacles is as follows: The paragraph: "The lack of sufficient training programs for students with ID and their parents to use AI applications in education" came in first place with an average of 2.608, while the paragraph: "The lack of sufficient training programs for teachers to use AI applications in education" came in second place with an average of 2.525, and the paragraph: "The lack of the necessary technical support in the required manner to include AI applications in the education of students with ID" came in third place with an average of 2.486. The previous table also shows that the overall average of the scores of obstacles faced by teachers of students with ID in using AI in education is 2.351, which indicates that these teachers face significant obstacles to using AI in education.

4.3. Results of the Answer to the Third Question

Which states: What is the proposed vision for the use of AI applications in education by teachers of students with ID?

We can answer this question based on the results of the current study in addressing the first and second questions, in addition to the results of previous studies consulted in the current research, as follows:

4.4. The Proposed Vision for the Use of AI By Teachers of Students With ID in Education

In light of the theoretical framework of the current study, including its presentation of the study problem and its importance, the significance of AI in our current lives in general, the importance of its inclusion in education, the results of previous studies presented in the current study, and the findings of the current field study regarding the use of AI in education by teachers of students with ID, we can develop a proposed vision for the use of AI by teachers of students with ID in education with their students, based on several main axes, namely:

4.4.1. First: The Foundations and Assumptions of Constructing the Concept

1. Individuals with ID require educational and social care through a focus on the practical aspects of school subjects, which AI applications in education provide.
2. One of the principles of educating and teaching individuals with ID is to rely on tangible methods, and perhaps this is what AI applications in education provide.
3. The state's interest in individuals with disabilities and its efforts to meet their educational, psychological, and social needs.
4. Providing attention and professional development for teachers, including those who teach individuals with ID, and training them in the use of AI in education has become a critical issue in our time, contributing to the development of students' performance.
5. AI has become not only a facilitating factor in our current life activities but has also become an important and influential factor in many other aspects of life, including industrial, technological, educational, and other fields.
6. The results of the field study contribute to defining the features of the proposed concept by identifying its basic aspects in a more realistic manner.

4.4.2. Second: Objectives of the Proposed Concept

1. Develop the skills of teachers of students with ID in using AI in education.
2. Develop a stimulating and encouraging learning environment for students with ID based on AI applications in education.
3. Work to solve many of the problems students with ID face in terms of attention, perception, and memory.
4. Overcome the problems students with ID face in terms of social adaptation, life skills, and independence.
5. Activate the role of the family (integration between school and family) in caring for and educating their children with ID.

4.4.3. Third: Procedures for Implementing the Vision's Objectives and Mechanisms

1. Develop the skills of teachers of students with ID in the use of AI in education.

- Prepare courses and workshops for teachers on the use of AI in education.
- Coordinate with universities to train teachers of students with ID on the use of AI in education.
- Integrate the use of AI in education into job performance evaluation.
- Organize an award at the ministry or education department level for the best teacher in using AI applications in education with their students.
- Recognize teachers who implement AI applications with their students.

2. Develop a stimulating and encouraging learning environment for students with ID that relies on AI applications in education.

- Provide education departments and schools with appropriate AI applications for the education of students with ID.
- Make the necessary adjustments to individual educational plans for students with ID to include appropriate AI applications in their activities.
- Increase reliance on digital technology in the education of students with ID, allowing for the integration of appropriate AI applications into their education and training.
- Activating the student's role in educational activities by selecting applications that facilitate role exchange between teachers and students during their implementation.

3. Work to solve many of the problems faced by students with ID in terms of attention, perception, and memory.
- Select applications that are appealing to students with ID, attracting their attention to education and training.
- Select effective and stimulating applications for students with ID, containing sound and light effects, attracting their attention to education and training.
- Select effective and stimulating applications for students with ID, containing simplified and explanatory explanations of the steps involved in the educational and training activities.
- Select effective and stimulating applications for students with ID, including a repetition mechanism and student participation in the activity, allowing students to easily absorb and remember the steps involved in the educational and training activities.

4. Overcome the problems faced by students with ID in terms of social adaptation, life skills, and independence.
- Select applications that include social situations (social interaction with others) for students with ID, and train them on them.
- Select applications that include role-playing situations for students with ID, and train them on them.
- Selecting and training applications that include situations for self-care skills for students with ID.
- Selecting and training applications that include situations for money handling skills for students with ID.
- Selecting and training applications that include situations for behavior modification for students with ID, by introducing and training them on positive behaviors and negative behaviors, and training them to abandon them.
- Schools and education departments will organize awards for the best family in collaboration with the school in using AI applications in the field of education and training with their children with ID.

5. Activating the role of the family (integration between school and family) in the care and education of their children with ID.
- Holding periodic meetings with parents of students with ID about the importance of training on AI applications in the field of education and training with their children.
- Explaining the importance of AI applications in teaching and training children in academic skills and daily life skills (independence skills).
- Training parents of students on AI applications in the field of education and training with their children.

4.4.4. Fourth: Obstacles to Implementing the Vision and Mechanisms to Address Them

1. Lack of adequate training programs for students with ID and their parents on the use of artificial intelligence applications in education.
2. Lack of adequate training programs for teachers on the use of artificial intelligence applications in education.
3. Lack of the necessary technical support to integrate artificial intelligence applications into the education of students with ID.
4. Lack of awareness among some teachers regarding the importance of using artificial intelligence applications in education for students with ID.
5. Inadequate abilities of students and their parents to solve problems they encounter when using artificial intelligence applications in education.
6. Lack of provision of artificial intelligence educational applications suitable for students with ID.
7. Lack of teacher experience in using artificial intelligence applications in education.

4.4.5. These Obstacles Can be Overcome Through the Following

1. Emphasis on providing adequate training programs for students with ID and their parents on the use of AI applications in education.
2. The need to provide specialized training programs for teachers to use AI applications in education with their students with ID.
3. The need for education and special education departments to provide the necessary technical support to integrate AI applications into the education of students with ID.
4. Providing awareness and guidance programs for teachers on the importance of using AI applications in education with their students with ID.
5. Hold periodic meetings with parents in schools to resolve any problems they encounter when using artificial intelligence applications in education with their children with ID.
6. Working to provide educational AI applications in schools that are compatible with the abilities and characteristics of students with ID.
7. Working to enhance teachers' expertise in using AI applications in education through partnerships between universities, education departments, and special education departments on training programs related to the integration of AI in education.
8. Working to enhance teachers' positive attitudes and expectations toward the use of AI applications in the education of students with ID.

5. Discussion

This study aimed to identify the attitudes of teachers of students with ID toward the use of AI applications in education and the obstacles to their use, while presenting a proposed vision for the use of these applications in education. The results

concluded that teachers of students with ID had low negative attitudes toward the use of AI in education with their students with ID. They obtained an overall mean of 1.481, which is considered a low value, indicating that they had positive attitudes toward the use of AI in education with their students.

The results of the current study are consistent with the findings of the studies of Makari and Ajwa [11]. This may indicate that their positive attitudes are a result of the teachers' participation in this study, which reflects their awareness of the effectiveness and positive impact of using artificial intelligence applications in their students' education, as confirmed by numerous studies, such as Standen et al. [25] and Montoya-Rodríguez et al. [24]. Therefore, it is important to increase their awareness of its multiple uses within the educational process through educational professional development programs. The item "I believe that teaching using artificial intelligence applications with my students with ID may cause me stress and fatigue" ranked first, with a mean of 1.698. The item "I express negative opinions about artificial intelligence applications in education to colleagues, parents, and students" ranked second, with a mean of 1.592. The item "I feel afraid of using artificial intelligence applications in teaching students with ID" ranked third, with a mean of 1.553. This can be explained by the multiplicity of tasks and burdens within the school, which makes them prefer to maintain their current educational strategies and not make changes to them or take on additional burdens that are not officially mandated, as its use may create additional teaching burdens for them. The results of the second question indicated that the study sample of teachers of students with ID had an overall average score of 2.351 regarding the obstacles to using artificial intelligence in education with their students with ID. This is considered a high score, despite their positive attitudes towards it, as demonstrated by the results of the first question. This indicates that teachers face many obstacles in using artificial intelligence in education with their students with ID, despite their awareness of the necessity of its use and the need to address the obstacles to its use. This requires providing adequate training programs for students, their parents, and the teachers themselves, in addition to finding the necessary technical support to integrate artificial intelligence applications into their students' education. This confirms the shortcomings in providing workshops and courses that enhance family partnerships, as well as the shortcomings in providing the necessary professional development for teachers. This result confirms their desire to learn about everything new and effective regarding the education of students with ID using artificial intelligence applications and achieving positive outcomes for their students, as its applications contribute to overcoming many challenges, including functional, cognitive, or communicative. Furthermore, the results emphasize the importance of working to remove these obstacles facing teachers, contributing to creating an appropriate and motivating educational environment for them to use artificial intelligence in education with their students with ID. This is consistent with Bressane et al. [14], who emphasized the importance of addressing the obstacles facing teachers in using artificial intelligence applications in education with their students.

In light of the results of the first and second questions, a proposed vision was developed under the title "A Proposed Vision for the Use of Artificial Intelligence Applications in Education by Teachers of Students with ID." This vision aims to develop the skills of teachers of students with ID in using artificial intelligence in education, develop a stimulating and encouraging educational environment for students with ID based on artificial intelligence applications in education, and work to solve many of the problems faced by students with ID in terms of attention, perception, and memory. It also aims to overcome these students' problems in social adaptation, life skills, and independence, with the ultimate goal of activating the family's role in this regard.

6. Limitations and Future Research

The sample of this study was limited to one governorate (Al-Ahsa) within the Kingdom of Saudi Arabia and one educational level (primary). There is still a gap in research concerning other governorates and educational levels. Additionally, researchers conducting future studies can explore the experiences and perspectives of stakeholders, such as general education teachers, specialists, and administrators, regarding the topic of this study. Future research can employ qualitative, measurable methods to collect data on stakeholders' perceptions, which would enable researchers to uncover in-depth insights and clarify the specificity of the topic being studied. Stakeholder opinions would contribute to understanding what could improve knowledge and use of AI applications in education and provide valuable information for program planning.

Practitioners Notes

What is already known about this topic

- AI supports the education of students with ID through studies that show that it can support skills and meet educational needs.
- Despite the interest in AI in particular, studies have indicated the limited current research on the use of artificial intelligence in the field of special education, specifically with individuals with ID and their education.
- Exploring the knowledge and use of AI in education by teachers of students with ID is an important aspect that needs to be understood and interpreted in order to provide the necessary support and improve their quality of life.

What this paper adds

- This article explores the knowledge and use of AI applications in education by teachers of students with ID.
- The article adds to the existing literature by focusing on the primary school stage, students with intellectual disabilities, taking the perspective of Saudi Arabia, and using a quantitative methodology, both of which are significant gaps in the research literature.
- The article highlights shortcomings in educational knowledge and practices and provides insight into how teachers support students with ID.

Implications for practice and/or policy

- Provides practical implications of the findings for educators, policy makers, and program designers.
- Highlights gaps in academic knowledge as a limitation to the use of AI for teaching in the education of students with ID.

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