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KINDERGARTEN TEACHERS' ATTITUDES TOWARD AI APPLICATIONS IN TEACHING CHILDREN WITH INTELLECTUAL DISABILITIES: A DESCRIPTIVE STUDY OF TECHNOLOGY ACCEPTANCE, READINESS, AND PERCEIVED EFFECTIVENESS

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ABSTRACT

This study aims to identify kindergarten teachers' attitudes toward the use of artificial intelligence (AI) applications in teaching children with intellectual disabilities. The research focuses on three main dimensions: technology acceptance, teachers' digital readiness, and the perceived effectiveness of AI based educational tools. A descriptive research design was employed, and a 31 item questionnaire distributed across the three dimensions was administered to a sample of 278 kindergarten teachers in the Eastern Province of the Kingdom of Saudi Arabia. The findings revealed moderately to highly positive attitudes toward the use of AI applications in education, with the technology acceptance dimension recording the highest mean scores, indicating teachers' readiness to adopt modern technologies. Results also showed that teachers' digital readiness was at a moderate level, reflecting the need for more specialized training in AI integration. The perceived effectiveness dimension achieved a high mean score, as teachers indicated that AI applications contribute to improving attention, increasing engagement, and providing individualized learning activities

tailored to the abilities of children with intellectual disabilities. The study recommends strengthening professional development programs for teachers, enhancing technological infrastructure in kindergartens, and providing AI based educational applications specifically designed to meet the needs of children with intellectual disabilities.

KEYWORDS: Artificial intelligence, kindergarten teachers, intellectual disabilities, technology acceptance, digital readiness, perceived effectiveness.

1. INTRODUCTION

International research indicates that AI applications—such as machine learning based assessment tools, intelligent tutoring systems, virtual reality environments, and large language models—have evolved into integrated educational ecosystems that enhance learning outcomes for students with special needs (Voultsiou & Moussiades, 2025; Kim & Park, 2022; Ahmed & Hassan, 2023). These technologies enable teachers to analyze behavioral, cognitive, and linguistic patterns with greater precision, facilitating the development of individualized educational plans aligned with each child's abilities (IEEE, 2024; Brown & Rivera, 2021). In relation to intellectual disabilities, studies have shown that AI can enhance attention, support communication, improve memory, and increase motivation through interactive, multisensory learning environments (Alkan, 2024; Smith & Lee, 2020).

The literature further emphasizes that AI enhanced learning environments promote inclusive education by reducing learning barriers, supporting differentiated instruction, and providing equitable learning opportunities for all students (UNESCO, 2022; Wang & Li, 2023). Intelligent systems—such as educational robots, adaptive learning platforms, and speech recognition technologies—have demonstrated their ability to improve social interaction, increase engagement, and provide continuous support for children with intellectual disabilities (Rahman & Omar, 2021; IEEE, 2024). These findings align with global trends highlighting the role of AI in early intervention, behavior modification, and the development of cognitive and social skills (Gomez & Torres, 2023; Journal of Disability Research, 2023).

In the Arab world, particularly in the Kingdom of Saudi Arabia, digital transformation initiatives aligned with Vision 2030 have strengthened the integration of AI technologies in education and expanded the supporting infrastructure, creating greater opportunities to enhance the learning of children with intellectual disabilities (Al Harbi, 2022; Al Zahrani, 2023). These national efforts underscore the crucial role of teachers as key agents in the successful integration of technology within classrooms (Hussein et al., 2025; Alkan, 2024).

The literature indicates that teachers' attitudes toward technology are among the most influential factors in AI adoption, as positive attitudes are associated with a greater willingness to use digital tools and integrate them into classroom practices (Davis, 1989; Kim & Park, 2022). Digital readiness—

including technical skills, self confidence, and problem solving abilities—also plays a fundamental role in determining the effectiveness of AI use (Wang & Li, 2023; Brown & Rivera, 2021). Moreover, the perceived effectiveness of educational technologies is a major factor influencing teachers' continued use of AI, particularly when they believe these tools enhance children's learning and increase their engagement (Journal of Disability Research, 2023; Smith & Lee, 2020).

Given this global and regional momentum toward integrating AI in education, there is a growing need to examine kindergarten teachers' attitudes toward using these technologies in teaching children with intellectual disabilities, especially in major educational regions such as the Eastern Province of Saudi Arabia, which has witnessed notable expansion in educational and technological services (Ministry of Education, 2023). Accordingly, this study aims to provide a deeper understanding of the factors influencing AI adoption in early childhood education by examining three key dimensions: technology acceptance, teachers' digital readiness, and the perceived effectiveness of AI applications, drawing on recent literature published in this field (Hussein et al., 2025; Alkan, 2024; IEEE, 2024).

Problem Statement and Research Questions

Despite the global expansion of artificial intelligence (AI) integration in education and the documented effectiveness of AI based tools in supporting the learning of children with intellectual disabilities, the use of such technologies in early childhood education within the Saudi context remains limited and insufficiently explored. The literature indicates that teachers' attitudes, their level of digital readiness, and their perceptions of the effectiveness of AI applications are among the most influential factors shaping the adoption of AI in classroom settings. However, a clear knowledge gap persists regarding kindergarten teachers' attitudes toward using AI in teaching children with intellectual disabilities, particularly in major educational regions such as the Eastern Province, which has recently witnessed significant growth in educational and technological services.

Based on this gap, the present study seeks to explore the factors influencing kindergarten teachers' adoption of AI applications in teaching children with intellectual disabilities. This is addressed through the following main research question:

What are kindergarten teachers' attitudes toward using artificial intelligence (AI) applications in teaching children with intellectual disabilities in the

Eastern Province of Saudi Arabia?

The following questions emerge from this main question:

1. What is the level of technology acceptance among kindergarten teachers regarding the use of AI applications?
2. What is the level of digital readiness among kindergarten teachers to use AI applications in education?
3. What is the level of perceived effectiveness of AI applications among kindergarten teachers?
4. Are there statistically significant differences in teachers' attitudes toward using AI applications attributable to demographic variables (experience, qualification, technology related training)?
5. What factors most strongly influence kindergarten teachers' adoption of AI applications in teaching children with intellectual disabilities?

1.1. Research Objectives

This study aims to achieve a set of objectives derived from the problem statement and research questions, as follows:

Main Objective

To identify kindergarten teachers' attitudes toward using artificial intelligence (AI) applications in teaching children with intellectual disabilities in the Eastern Province of Saudi Arabia.

Sub Objectives

1. To determine the level of technology acceptance among kindergarten teachers regarding the use of AI applications.
2. To measure the level of digital readiness among kindergarten teachers to use AI applications in education.
3. To examine the level of perceived effectiveness of AI applications among kindergarten teachers.
4. To identify differences in teachers' attitudes toward using AI applications based on demographic variables (experience, qualification, technology related training).
5. To determine the factors that most strongly influence kindergarten teachers' adoption of AI applications in teaching children with intellectual disabilities.

1.2. Significance of Study

The significance of this study emerges from several theoretical, practical, and social considerations, summarized as follows:

1. Theoretical Significance

- The study addresses a clear research gap regarding the limited number of investigations exploring kindergarten teachers' attitudes toward using AI in teaching children with intellectual disabilities within the Saudi context.
- It provides a scientific framework for understanding the factors influencing AI adoption by examining three key variables: technology acceptance, digital readiness, and perceived effectiveness.
- It enriches contemporary literature in special education and educational technology, particularly in early childhood settings.

2. Practical Significance

- The findings can support policymakers in the Ministry of Education in developing strategies and programs that promote the integration of AI in kindergarten classrooms.
- The study offers valuable insights into teachers' readiness levels, helping guide the design of targeted professional development programs.
- It aligns with Saudi Vision 2030 by contributing to national efforts aimed at enhancing digital transformation and innovation in education.
- It provides practical recommendations that may improve the quality of education for children with intellectual disabilities through the effective use of AI technologies.

3. Social Significance

- The study promotes inclusive education by highlighting the role of AI tools in supporting the learning and engagement of children with intellectual disabilities.
- It raises awareness among educators and stakeholders about the importance of AI in enhancing educational services for this population.

1.3. Operational Definitions

Artificial Intelligence (AI) Digital systems and technologies that rely on algorithms and machine learning to provide interactive educational support for children with intellectual disabilities, including intelligent systems, educational robots, and language models.

1. Intellectual Disability A developmental condition characterized by significant limitations in intellectual functioning and adaptive behavior, affecting learning, communication, and daily life skills. It includes children who require specialized educational support.

2. **Technology Acceptance** The extent to which kindergarten teachers are willing to use AI applications, including their perceptions of usefulness and ease of use. It is measured through the technology acceptance dimension of the study instrument.
3. **Digital Readiness** The level of technical skills, digital competence, and self confidence teachers possess to effectively use AI tools in education. It is measured by the digital readiness dimension in the questionnaire.
4. **Perceived Effectiveness** Teachers' beliefs about the extent to which AI applications enhance learning, engagement, and skill development among children with intellectual disabilities. It is measured through the perceived effectiveness dimension.
5. **Teachers' Attitudes** The positive or negative dispositions held by kindergarten teachers toward the use of AI in teaching. It is measured by the overall score on the teachers' attitudes scale.

2. DELIMITATIONS OF THE STUDY

Subject Delimitations The study focuses exclusively on examining kindergarten teachers' attitudes toward the use of AI applications in teaching children with intellectual disabilities. It is limited to three main constructs: • Technology acceptance • Digital readiness • Perceived effectiveness The study does not address other types of disabilities or different educational stages.

1. **Geographical Delimitations** The study is conducted in the Eastern Province of the Kingdom of Saudi Arabia, selected due to its size and its ongoing expansion in digital transformation and technological services.
2. **Population Delimitations** The study is limited to female kindergarten teachers working in public and private schools. It does not include male teachers or teachers from other educational levels.
3. **Time Delimitations** The study was carried out during the 2025/2026 academic year, which represents the period during which data were collected.

3. METHODOLOGY AND PROCEDURES

3.1. Research Design

The study employed a descriptive correlational design, which is widely used in educational research to analyze relationships among variables as they naturally occur without researcher intervention (Creswell & Creswell, 2018). This design was

appropriate for the present study, which aimed to examine the relationships among technology acceptance, digital readiness, and perceived effectiveness among kindergarten teachers in teaching children with intellectual disabilities. The choice of this design aligns with recent recommendations in the fields of artificial intelligence and special education (Marino et al., 2023; Hussein et al., 2025).

3.2. Population

The study population consisted of all kindergarten teachers working in public and private schools in the Eastern Province of Saudi Arabia during the 2024/2025 academic year. This population was selected due to its direct relevance to the integration of artificial intelligence in educational settings, particularly in the context of teaching children with intellectual disabilities (Al Harbi, 2022; Al Qahtani, 2021).

3.3. Sample

A stratified random sampling technique was used to ensure adequate representation of both public and private schools. After excluding incomplete responses, the final sample consisted of 278 teachers, which meets the statistical power requirements for correlational studies (Cohen, 2018).

Table 1. Distribution of the Study Sample by Governorate (N = 278).

Governorate	Frequency	Percentage (%)
Dammam	112	40.3
Khobar	74	26.6
Dhahran	38	13.7
Qatif	32	11.5
Al Ahsa	22	7.9
Total	278	100

3.4. Instrument

The study utilized a 31 item questionnaire distributed across three main constructs, developed based on well established theoretical models in the literature:

1. Technology Acceptance (10 items)

Based on the Technology Acceptance Model (TAM) developed by Davis (1989), measuring: Perceived ease of use

- Behavioral intention to use AI TAM is one of the most widely used models for explaining technology adoption in educational contexts (Kim & Park, 2022).

2. Digital Readiness (10 items)

Grounded in the TPACK framework (Mishra & Koehler, 2006), measuring:

- Technological knowledge

- Pedagogical knowledge
- Digital confidence Recent studies emphasize the importance of digital readiness for successful AI integration in education (Wang & Li, 2023).

3. Perceived Effectiveness (11 items)

Based on Teo (2019), measuring: AI effectiveness in enhancing learning

- AI effectiveness in supporting children with intellectual disabilities
- AI effectiveness in promoting engagement The literature identifies perceived effectiveness as a key determinant of teachers’ adoption of intelligent technologies (Gomez & Torres, 2023).

All items were rated on a five point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

3.5. Validity

1. Face and Content Validity

The questionnaire was reviewed by seven experts in special education, measurement and evaluation, and educational technology. The agreement rate reached 92%, indicating strong relevance and clarity of the items (O’Connor & Flynn, 2021).

2. Construct Validity

An Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) was conducted, yielding the following results:

Table 2: Exploratory Factor Analysis Results (N = 278).

Statistical Indicator	Value	Interpretation
KMO	0.91	Excellent sampling adequacy
Bartlett’s Test	$\chi^2 = 2154.73$	Suitable for factor analysis
Significance	$p < .001$	Statistically significant
Factor loadings	0.62–0.88	Strong loadings
Extracted factors	3	Consistent with instrument structure
Explained variance	67.4%	High variance explained

These results confirm the strong factorial structure of the instrument (Baker & Smith, 2020).

3.5.1. Reliability

Cronbach’s alpha coefficients were calculated for each construct:

Table 3: Reliability Coefficients.

Construct	Items	Cronbach’s Alpha
Technology Acceptance	10	0.86
Digital Readiness	10	0.89
Perceived Effectiveness	11	0.91
Overall Instrument	31	0.93

These coefficients indicate excellent internal consistency (Teo, 2019).

3.6. Data Collection Procedures

Data collection followed a structured and ethically compliant process. Official approval was obtained from the Eastern Province Education Directorate. An electronic version of the questionnaire was created using Google Forms and distributed through official communication channels, including email and professional school groups. Participants were informed that their responses would remain confidential and used solely for research purposes, in accordance with international ethical guidelines (UNESCO, 2022).

Data collection lasted three weeks. After screening for missing values and outliers, 278 valid responses were retained. A significance level of $\alpha = 0.05$ was adopted for all analyses.

4. STATISTICAL ANALYSIS

Data was analyzed using SPSS (Version 28). Descriptive statistics (means, standard deviations, skewness, kurtosis) were used to summarize the data. Inferential statistics included:

- Pearson correlation
- Multiple regression
- One way ANOVA

Assumptions of normality, independence, and multicollinearity were verified using the Kolmogorov–Smirnov test, Durbin–Watson statistic, and VIF values.

4.1. Results

4.1.1. Descriptive Statistics

Table 4: Means and Standard Deviations of Study Variables (N = 278).

Variable	M	SD	Level
Technology Acceptance	4.12	0.58	High
Digital Readiness	3.94	0.63	Moderate-High
Perceived Effectiveness	4.21	0.54	High

4.2. Correlation Analysis

Table 5: Pearson Correlations Among Study Variables.

Variable	1	2	3
1. Technology Acceptance	–	.61**	.68**
2. Digital Readiness	.61**	–	.72**
3. Perceived Effectiveness	.68**	.72**	–

Note. p < .01.

4.3. Multiple Regression Analysis

Table 6: Multiple Regression Predicting Perceived Effectiveness

Predictor	B	SE	β	t	p	95% CI
Technology Acceptance	0.28	0.05	.31	5.42		[0.18, 0.38]
Digital Readiness	0.41	0.05	.49	8.11		[0.31, 0.51]
Model Summary						
R = .79	R ² = .62	Adjusted R ² = .61				

The model explained **62%** of the variance in perceived effectiveness.

4.4. ANOVA (Demographic Differences)

Table 7. ANOVA Results by Years of Experience

Variable	F	p
Years of Experience	3.12	.046

Significant differences were found in favor of more experienced teachers.

4.4. Summary of Findings

The study revealed that kindergarten teachers reported high levels of technology acceptance and perceived effectiveness regarding the use of artificial intelligence (AI) applications in teaching children with intellectual disabilities. Digital readiness was rated at a moderate high level. All correlations among the study variables were positive and statistically significant. Multiple regression analysis showed that digital readiness and technology acceptance jointly predicted perceived effectiveness, accounting for 62% of its variance. ANOVA results indicated statistically significant differences based on years of experience, with more experienced teachers demonstrating higher perceived effectiveness.

4.5. Discussion

This study examined kindergarten teachers' attitudes toward the use of AI applications in teaching children with intellectual disabilities by assessing technology acceptance, digital readiness, and perceived effectiveness, as well as exploring demographic differences and predictors of AI adoption. The findings offer several important insights aligned with existing literature and theoretical models.

The high level of technology acceptance reflects teachers' positive attitudes toward integrating AI into educational settings. This aligns with findings by Kim and Park (2022) and Gomez and Torres (2023), who reported increasing acceptance of smart technologies among educators. The results also

support the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use shape positive attitudes toward technology.

Digital readiness, although moderate high, was lower than technology acceptance. This suggests that while teachers are willing to use AI, they may lack sufficient digital skills or access to adequate training. This interpretation is consistent with Wang and Li (2023), who emphasized the influence of institutional support and professional development on digital readiness. The gap between willingness and capability highlights the need for targeted training programs.

Teachers also reported high perceived effectiveness of AI applications, indicating recognition of AI's potential to enhance learning outcomes for children with intellectual disabilities. This finding aligns with Al Harbi (2022) and Marino et al. (2023), who highlighted AI's role in personalization and adaptive learning in special education contexts.

Correlation analysis revealed strong positive relationships among technology acceptance, digital readiness, and perceived effectiveness. These results reinforce the TAM framework and support previous studies showing that teachers with higher digital readiness are more likely to perceive educational technologies as effective.

Multiple regression analysis identified digital readiness as the strongest predictor of perceived effectiveness, followed by technology acceptance. This suggests that teachers with stronger digital skills are better positioned to use AI effectively, consistent with Li (2023), who identified digital readiness as a key determinant of technology adoption.

ANOVA results showed significant differences based on years of experience, with more experienced teachers reporting higher perceived effectiveness. This may be attributed to greater confidence and professional maturity, as noted by Hussein et al. (2025) and Al Mutairi (2022). The absence of differences based on academic qualification or technical training suggests that current training programs may be insufficient or not directly linked to digital competence.

Overall, the findings demonstrate positive attitudes toward AI use in early childhood education and underscore the importance of digital readiness and professional experience in supporting effective AI adoption.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The study concluded that kindergarten teachers

hold positive attitudes toward the use of AI applications in teaching children with intellectual disabilities. Technology acceptance and perceived effectiveness were high, while digital readiness was moderate high. Digital readiness emerged as the strongest predictor of perceived effectiveness, highlighting the importance of digital competence in successful AI integration. The findings emphasize the need for enhanced training, supportive environments, and structured policies to promote effective AI adoption in early childhood education.

5.2. Recommendations

Based on the findings, the following recommendations are proposed:

- Strengthen teachers' digital skills through continuous professional development programs focused on AI applications in special education.
- Provide adequate technological infrastructure in kindergartens, including devices, reliable internet access, and ongoing technical support.
- Integrate AI applications into curricula and learning activities tailored to the needs of children with intellectual disabilities.
- Encourage teachers to adopt educational innovation through incentives and professional growth opportunities.
- Raise parental awareness of the role of AI in supporting children's learning.
- Develop clear educational policies that ensure the safe, ethical, and responsible use of AI in early childhood settings.

5.3. Practical Implications

This study provides several practical implications:

- Informing the design of training programs aimed at enhancing teachers' digital readiness.

- Supporting policymakers in developing strategies that promote AI integration in early childhood education.
- Offering schools a practical framework to assess their digital readiness before implementing AI technologies.
- Enriching the Arabic literature on AI use in special education, a field that remains underexplored.

5.4. Limitations

Several limitations should be considered:

- The study was limited to one geographical region, which may restrict generalizability.
- The descriptive correlational design does not allow for causal inferences.
- Reliance on self reported questionnaires may introduce response bias.
- The study focused on three variables only, while other influential factors may exist.
- Future Research Directions
- Future studies are encouraged to:
 - Expand the sample to include multiple regions to enhance generalizability.
 - Employ experimental designs to examine the direct impact of AI applications on learning outcomes.
 - Investigate additional variables such as institutional support, innovation orientation, and educational leadership.
 - Conduct qualitative studies to gain deeper insights into teachers' experiences.
 - Assess the impact of AI on children's skills rather than relying solely on teachers' perceptions.
 - Develop assessment models to evaluate schools' readiness for AI adoption.

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- Dr. Ramadan Ashour Hussein Salem: Contribution to the theoretical framework, literature review, interpretation of results, and scientific revision.
- Dr. Naglaa Mahmoud Mohammed Alhabashi: Literature review, content validation, and development of the discussion section.
- Dr. Ghada Elnour Elterafi Abdelrhman: Instrument design, statistical review, and methodological verification.
- Dr. Refka Makram Barsom: Data collection, linguistic review, and coordination of tables and appendices.
- Dr. Maha Mohamed Kamal Altaher: Review of educational and technological aspects, refinement of

recommendations, and ensuring coherence across sections.

All authors confirm that these contributions align with the CRediT taxonomy and that they have approved the final manuscript.

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Conflict of Interest Statement

The authors declare no conflict of interest, whether financial, institutional, or personal. All aspects of the study were conducted independently and without external influence.

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Ethical Approval

Ethical approval was obtained from the relevant institutional authorities prior to data collection. The researchers ensured confidentiality, protected participants' privacy, and used all collected data solely for scientific purposes.

Informed Consent

Informed consent was obtained from all participants after explaining the study's purpose, procedures, and voluntary nature. Participants were assured of confidentiality and their right to withdraw at any time.

Data Availability Statement

The data supporting this study are available from the authors upon reasonable request for legitimate research purposes. All shared data will be anonymized to protect participant confidentiality.

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