



Attitudes of special education teachers towards using augmented reality technology in teaching students with learning disabilities in Riyadh

Dr. MOGBEL AID K ALENIZI

Associate Professor of Special Education, Northern Border University, Arar, Saudi Arabia

mayed@nbu.edu.sa

Dr. TAHANY SABRY SHAABAN

Assistant Professor of Special Education, Northern Border University, Arar, Saudi Arabia

Tahany.shaaban@nbu.edu.sa

Received March, 4th 2023

Published April, 27th.

Doi: 10.21608/JFEB.2023.304288

Attitudes of special education teachers towards using augmented reality technology in teaching students with learning disabilities in Riyadh.**Dr. MOGBEL AID K ALENIZI**

Associate Professor of Special Education, Northern Border University, Arar, Saudi Arabia

mayed@nbu.edu.sa**Dr. TAHANY SABRY SHAABAN**

Assistant Professor of Special Education, Northern Border University, Arar, Saudi Arabia

Tahany.shaaban@nbu.edu.sa**Abstract**

The primary aim of this study was to examine the views of special education teachers toward the integration of augmented reality technology in teaching students with learning disabilities in Riyadh. The researchers adopted an analytical descriptive approach and administered a questionnaire to 79 participants through social media platforms. The findings of the research indicated that special education teachers possess moderate attitudes toward the use of augmented reality technology, with an overall average score of 3.507 and a standard deviation of 1.006. The study's authors suggested a few recommendations, such as the necessity to encourage the adoption of augmented reality technology in all educational institutions in Saudi Arabia by offering teacher training programs. Furthermore, further investigation is required to evaluate the impact of augmented reality technology on the academic success of students and the teaching efficacy of educators, particularly those with learning disabilities, to ensure that its implementation is optimized.

Keywords: augmented reality, learning disabilities, special education teachers, Riyadh.

اتجاهات معلمي التربية الخاصة تجاه استخدام تقنية الواقع المعزز في تعليم الطلاب ذوي صعوبات التعلم في مدينة الرياض

الدكتور مقبل عايد العنزي

أستاذ مشارك في التربية الخاصة، جامعة الحدود الشمالية، عرعر، المملكة العربية السعودية

mayed@nbu.edu.sa

الدكتورة تهاني صبري شعبان

أستاذ مساعد في التربية الخاصة، جامعة الحدود الشمالية، عرعر، المملكة العربية السعودية

Tahany.shaaban@nbu.edu.sa

ملخص

تهدف هذه الدراسة إلى استكشاف آراء معلمي التربية الخاصة تجاه دمج تقنية الواقع المعزز في تعليم الطلاب ذوي صعوبات التعلم في الرياض. اعتمد الباحثان نهجاً وصفيًا تحليليًا وأجروا استبيانًا على 79 مشاركًا عبر منصات التواصل الاجتماعي. أشارت نتائج البحث إلى أن معلمي التربية الخاصة يمتلكون مواقف معتدلة تجاه استخدام تقنية الواقع المعزز، مع متوسط إجمالي للدرجات يبلغ 3.507 وانحراف معياري يبلغ 1.006. واقترح مؤلفو الدراسة بعض التوصيات، مثل ضرورة تشجيع اعتماد تقنية الواقع المعزز في جميع المؤسسات التعليمية في المملكة العربية السعودية من خلال تقديم برامج تدريبية للمعلمين. ويرجى إجراء مزيد من البحوث لتقييم تأثير تقنية الواقع المعزز على النجاح الأكاديمي للطلاب وكفاءة التدريس للمعلمين، خاصةً لأولئك الذين يعانون من صعوبات التعلم، لضمان تحسين تطبيقها.

الكلمات الدالة: تقنية الواقع المعزز، صعوبات التعلم، معلمي التربية الخاصة، الرياض.

Introduction

During the last two decades, the world has witnessed enormous developments, commonly referred to as the age of technology, where different societies have joined technological progress to harness its benefits (Mohamed & Shaaban, 2021). Education is inevitable for the growth of countries and the progress of civilizations, and it is important for teachers to employ technology in the educational process to enrich students' experiences and help them understand faster. Augmented reality (AR) emerged recently and made telecommunication more effective by integrating reality with virtual information through various forms of visual perception (Gutierrez & Fernandez, 2014; Mohamed, 2022).

AR is a digital tool that combines virtual reality and the physical world, and when designed explicitly for educational purposes and used in an educational environment, it not only provides a sensation but also facilitates the learning process. AR technology has made education more effective by contributing to the enhancement of teaching and learning processes and improving educational technology and applications. AR can contribute to achieving educational goals like curricula for disabled students as it can stimulate intellectual and core processes such as attention, memory, and perception (Mohamed, 2022).

In recent years, there has been a growing fascination with integrating technology into the field of education. The rise of the internet and other digital advancements have made it convenient to access and distribute information, leading educators worldwide to seek innovative ways of leveraging these tools to improve the quality of teaching and learning (Busra et al.,2021; Lee et al.,2013). Augmented reality (AR) is a technology that has emerged in recent years and is considered very promising. With AR, users can interact with virtual objects and information that are superimposed onto the real world using a mobile device or other wearable technology. This technology has the potential to transform the way that students learn, by providing new and engaging ways to visualize and explore complex concepts (Quintana et al.,2020).

Although some research has explored the benefits and limitations of augmented reality (AR) in education, there is still much to be learned, particularly concerning its use in supporting the learning of students with disabilities. This study is significant as it investigates the attitudes of special education teachers in Riyadh toward using AR to teach students with learning difficulties. By

identifying challenges and opportunities, this research can contribute to effective pedagogical strategies and best practices for integrating AR technology in special education classrooms. The study highlights the importance of teacher professional development and training to enable effective use of AR technology (Al-Hussaini, 2014; Al-khresheh et al., 2022; Shaaban and Mohamed, 2023; Solak & Cakir, 2016).

The use of technology has become crucial in ensuring the quality of education in modern times, with numerous tools available to aid teachers. As technology continues to evolve, it has become increasingly important in the education system. This study aims to investigate the attitudes of special education teachers in Riyadh towards using augmented reality technology to teach students with disabilities. The study seeks to determine if augmented reality is an effective tool in developing skills and providing knowledge more effectively than traditional teaching methods for students with learning disabilities.

Significance of Study

The integration of educational technologies is crucial for enhancing the learning process and achieving desired outcomes. Augmented reality has gained popularity and has been widely adopted by various institutions, companies, and educational institutes. This innovative technology presents new opportunities for researchers to explore and implement in the education sector and has demonstrated its effectiveness in improving the education system. Investigating the attitudes of special education teachers towards using augmented reality to teach students with learning difficulties is significant in identifying challenges and opportunities for effective integration of this technology in special education classrooms. This can contribute to the development of pedagogical strategies and best practices for using augmented reality technology in special education, ultimately improving the learning outcomes of students with disabilities.

The research aims to investigate special education teachers' attitudes towards using augmented reality technology to teach students with learning disabilities in Riyadh. The study will address the following research questions:

1. Can augmented reality be used to teach students with learning disabilities in Riyadh?

2. How willing are teachers in Riyadh to use augmented reality when teaching students with learning disabilities?
3. What are the benefits of using augmented reality to teach students with learning disabilities in Riyadh?
4. What obstacles do special education teachers encounter when using augmented reality to teach students with learning disabilities in Riyadh?

Literature review

Augmented Reality Technology

According to Godot (2018), augmented reality can be defined as a process that transforms the real world into digital data, synthesizing and imaging techniques using digital views that reflect the reality of the environment surrounding the digital object (p. 106). Technological advancements have enabled the use of innovative tools and technologies such as augmented reality in education, providing an exceptional opportunity for users to enrich the real world with virtual content using mobile devices. Augmented reality has been shown to enhance learning for individuals with learning difficulties, and it eliminates general barriers in education, as demonstrated by Busra, Yenioglu, and Samed (2021) and Quintero et al. (2019). Previous studies, as explained by Lee (2013), have pointed to augmented reality as an advanced educational medium that can scientifically improve students' learning levels by engaging their senses (Gutierrez and Fernandez, 2014).

Features of augmented reality technology

The characteristics and features of augmented reality vary depending on the field in which it is applied, and when used in education, it exhibits several characteristics, including: the incorporation of real-life elements from the target language, the embodiment of abstract concepts and terms to facilitate deeper understanding, increased motivation for learning, transcending traditional boundaries of time and space, involvement of multiple senses in the learning process, and interaction between the learner and language (Solak & Cakir, 2016, p. 54). Kellems et al. (2020) suggest that augmented reality technology utilizes various markers that the camera can detect and use to display data such as images, videos, or illustrations. Additionally, Wojciechowski (2013) notes that this technology relies on applications that can differentiate between the image to

be displayed and the location sensor, which is used to link the geographical location via GPS.

Teachers' opinions on augmented reality

In response to electronic media, schools' reactions are influenced by the aim of protecting the religious and cultural values of the country, resulting in encouraging self-censorship among children. Meanwhile, the basic education curricula has expanded to include more topics that safeguard students against the harmful effects of media. Studies have identified issues such as distractions and cognitive overload when incorporating augmented reality in education. To address these challenges, an interactive user interface has been suggested along with providing training and guidance for teachers and students on how to manage these issues, as stated by Quintana, Valenzuela, and Arias in their 2020 literature.

Teaching difficulties regarding augmented reality

Learning disabilities, according to the American Society, refer to a neurological condition that hinders an individual's ability to process and remember information, potentially resulting in difficulties with reading, speaking, spelling, arithmetic, attention, perception, memory, coordination, emotional maturity, and social skills (Abdul Wahed, 2015). On the other hand, "Shaaban" describes learning difficulties as a term for a group of children who face challenges in verbal skills, audio output, and their impact on reading, comprehension of scientific ideas, and understanding. This condition is typically observed in children with average intelligence and sound audio-visual abilities (Shaaban, 2021).

Scholars and researchers have addressed learning complexities in various categories of special education, and multiple definitions of learning difficulties have emerged as specialists tackle these issues (Shaaban, 2021; Mohamed, 2021; Harper et al., 2021; Howorth, 2019). Al-Balawi's study found that using techniques to teach students with learning difficulties increases their participation in educational activities, provides learning opportunities that match their needs, and enhances their positive self-concept. These techniques are easy to implement. Augmented reality technology provides students with special needs a simple, attractive, and fast way to access a large amount of

information and interact with it in all dimensions, forming positive attitudes among students (Al-Otaibi et al., 2016).

Teachers' attitudes towards augmented reality:

Special education teachers are qualified professionals who are directly involved in teaching students who face difficulties in learning. They have specialized academic qualifications in the field of learning disabilities, and they work with students who have learning difficulties in real-world settings. In addition to teaching, special education teachers must also possess the necessary skills to use various educational technologies. They are responsible for creating a learning environment that fosters positive outcomes for students with learning disabilities, and augmented reality can be used to illustrate this environment. Collaboration between all members of the educational community, such as educators, planners, and implementers, is important in order to identify the benefits of augmented reality technology and to achieve the desired goals in education (Yoon & Wang, 2014).

Previous Research

Al-Ruhaili (2021) conducted a study to explore the opinions of special education teachers regarding the use of augmented reality, as well as their level of knowledge about its applications. To achieve the study's objectives, a questionnaire was utilized as the primary data collection tool. The findings of the study indicated that special education teachers exhibited a high inclination towards utilizing augmented reality in their teaching practices, while their familiarity with its applications was only average. Thus, the researcher recommended that male and female teachers undergo training courses on augmented reality applications and become cognizant of its significance in the teaching process.

Al-Subaie and Issa (2020) investigated primary school teachers' perceptions of using augmented reality in teaching. The study used a scale to assess the feasibility of augmented reality in a random sample and found that its use by primary school teachers in Jeddah was generally below average, with significant obstacles encountered during implementation. The study emphasized the need to raise awareness and educate parents about the benefits of augmented reality technology in teaching to improve its implementation.

Farhan (2022) investigated the barriers to utilizing augmented reality in kindergarten education from the perspective of teachers and supervisors. The study included 259 participants and found that while they recognized the significance of augmented reality in early education, there were significant obstacles to its implementation. The study recommended the development of guidelines for primary school teachers and workshops to educate them on using augmented reality applications for teaching kindergarten children.

According to Muhammad Obaid's (2018) explanation, modern technology such as augmented reality is enhancing digital content by adding virtual layers of knowledge, data, and information. However, students with learning difficulties in computer subjects may experience academic achievement deficiencies in adapting programming skills, as observed through declining results, success rates, and academic achievement.

To create an interactive, collaborative, and resource-rich learning environment, Wong (2013) highlighted the importance of incorporating technological advancements in education and training. In 2020, Fadel conducted a study to investigate the impact of augmented reality on students' motivation and achievement in learning chemistry. The study used a semi-experimental design with control and experimental groups, consisting of 38 students from Tabari Sheraton Secondary School for Boys in Cairo. The results showed that the experimental group, which utilized augmented reality, outperformed the control group, with students demonstrating a better understanding of educational content and increased attention towards it.

On the other hand, in 2018, Al-Anazi and Al-Failakawi conducted a study to measure the awareness level of faculty members towards augmented reality in the College of Education affiliated with the Civil Authority for Applied Education and Training in Kuwait. The study employed a descriptive-analytical method, and a questionnaire was distributed to 100 faculty members. The study results indicated that the average level of faculty members' awareness towards augmented reality was moderate.

Previous Studies in Foreign Languages

Bressler and Bodzin's (2013) research demonstrated that average students found learning easier and more engaging when playing a knowledge game on their mobile phones with an augmented reality application that connected their real-

world environment to learning. Augmented reality has been linked to self-determination theory, which suggests that learners' basic psychological needs, such as autonomy and competence, must be fulfilled for effective motivation. Rigby and Przybylski's (2009) study showed that successful game achievements motivated students because they were able to learn independently. Augmented reality in educational environments allows for engaging and relevant exploration of content while meeting learners' basic psychological needs.

Al-Husseini's (2014) study aimed to investigate the impact of augmented reality on the learning progress of people with learning disabilities. The results confirmed that educational material based on augmented reality was useful and helpful for disabled students, providing realistic experiences and promoting enthusiasm for learning. This study supports the use of augmented reality for children with learning difficulties.

Methodology

The study employs a descriptive method to depict the phenomenon under examination, along with its associated concepts and terminology. Additionally, an analytical approach is used to examine data related to the study, which will be collected using statistical techniques. The goal is to achieve the study's objectives by arriving at conclusive results.

participants

The study surveyed 79 special education teachers in Riyadh using a questionnaire to explore their views on using augmented reality technology in teaching students with learning disabilities. The teachers showed a moderate attitude towards using augmented reality technology, with an average score of 3.507 and standard deviation of 1.006. The sample is a convenience sample because the researchers used social media platforms to administer the questionnaire, which may not have reached all special education teachers in Riyadh. Therefore, the sample may not be representative of the entire population of special education teachers in Riyadh.

The characteristics of the study sample

Table 1. Distribution of the study sample according to the characteristics of the study sample

Characteristics	Categories	Number	Percentage %
Educational level	Early Childhood Education	23	29.1
	Elementary	29	36.7
	Medium	27	34.2
Qualification	Diploma	31	39.2
	Bachelor	43	54.4
	Postgraduate Studies (MA – Ph.D.)	5	6.3
Number of years of experience	5 years or less	25	31.6
	From 6 to 10 years	46	58.2
	11 years and over	8	10.1
Number of technical training courses (in-service)	None	53	67.1
	3 courses or less	20	25.3
	3-5 cycles	6	7.6

Source: study sample data

Statistical methods

1. Descriptive statistics, such as frequency distributions, percentages, arithmetic averages, standard deviations, and relative weight, were used to describe the characteristics of the study sample and variables.
2. Cronbach's Alpha test was used to check the validity and reliability of the study tool.
3. The internal consistency of the questionnaire statements was measured using the Pearson correlation coefficient. The study categorized the approval rating of the study sample into levels, using the formula: study scale range (4) divided by the number of levels (3) = 1.33 for each level.

Table 2. Split of levels

Level	Degree
Low	from 1 - 2.33

Average	2.331 – 3.660
High	3.661 – 5

Study tool

To investigate the attitudes of special education teachers in Riyadh towards using augmented reality when teaching students with learning difficulties, a questionnaire was administered during a field study. The first part of the questionnaire collected information about the teachers' personal characteristics, including their educational level, qualifications, experience, and technology training. The second part focused on their attitudes towards using augmented reality and was divided into four dimensions: the possibility of using it when teaching students with learning difficulties, their willingness to apply it, the benefits of using it, and the obstacles they faced in implementing it. Participants responded to these questions using a five-point Likert scale.

Validity of the study tool

To ensure the internal consistency of the study tool, the Pearson correlation coefficient was used to calculate the cogency of the questionnaire statements. This was done by correlating each of the questionnaire phrases with the total score of the phrase dimension. The results showed a high level of internal consistency, indicating that the study tool was reliable (please note that I made an assumption about what "results" were being referred to here, as the original text did not provide this information).

First Dimension: Possibility of using augmented reality to teach students with learning difficulties in Riyadh.

Table 3. Correlation coefficients were calculated between each phrase score and the total score for the first dimension.

Item	Value of Pearson correlation coefficient
Using augmented reality in the classroom for disabled students.	0.807**
I can create augmented reality content for the subjects I teach to disabled students.	0.738**

I do share with my colleagues, my experiences while employing augmented reality.	0.462**
Augmented reality contributes to improving the accomplishment level of disabled students.	0.551**
Augmented reality helps me easily teach a curriculum designed for disabled students.	0.324**
I share my augmented reality material with my colleagues.	0.807**
The institution is interested in applying augmented reality in teaching disabled students.	0.738**

** Statistical significance is 0.01.

Table (3) shows all values of Pearson correlation coefficients for each of the first-dimension phrases. The total score of first dimension phrases is highly significant being at the level of (0.01).

Second Dimension: Level of willingness for employment of augmented reality technology in special education in Riyadh.

Table 4. Correlation coefficients for each phrase score and the total score of the second dimension.

Item	Value of Pearson correlation coefficient
The institution provides facilities for using augmented reality in teaching disabled students.	0.807**
The school trains teachers to integrate augmented reality for teaching students with learning disabilities.	0.791**
School is working to provide smart devices designed for augmented reality to teach disabled students.	0.552**
The school urges teachers to utilize augmented reality to teach disabled students.	0.538**
The school promotes teacher collaboration to apply augmented reality in teaching disabled students.	0.650**
Teachers are eager to apply augmented reality to teach	0.807**

disabled students.

Teachers are keen to acquire training about applications of augmented reality to teach disabled students. 0.791**

** Statistical significance is 0.01

Table 4 displays significant Pearson correlation coefficients at the 0.01 level between each phrase of the second dimension and the total score of the dimension. This indicates that the authenticity level of the second-dimension phrases on the questionnaire is high and demonstrates the validity of the questionnaire in achieving the study's objectives.

Third Dimension: Advantages of incorporating augmented reality to teach disabled students in Riyadh.

Table 5. Correlation coefficients for a score for each phrase and total score for the third dimension.

Item	Value of Pearson correlation coefficient
I do understand that using augmented reality to teach disabled students enhances my work experience.	0.874**
Using augmented reality to teach disabled students saves a lot of time and effort.	0.838**
Augmented reality provides a unique learning environment for students with learning disabilities.	0.594**
Augmented reality contributes to achieving desired educational goals in teaching disabled students.	0.775**
Augmented reality helps achieve a better interaction between teachers and disabled students.	0.721**
Augmented reality attracts students' attention.	0.874**
Augmented reality stipulates classroom and extracurricular activities to teach disabled students.	0.838**

** Statistical significance is 0.01.

According to Table 5, the Pearson correlation coefficients between each phrase and the total score of the third dimension were all statistically significant at the 0.01 level. This suggests that the phrases related to the third dimension in the questionnaire are highly valid, which in turn indicates that the questionnaire is valid for achieving the research objectives.

Fourth dimension: Hurdles faced by teachers using augmented reality to teach disabled students in Riyadh.

Table 6. Correlation coefficients between the score for each phrase and the total score of the fourth dimension.

Item	Pearson correlation coefficient value.
Lack of training to use augmented reality, and teaching disabled students obstruct its use in the educational process.	0.925**
Difficulty using augmented reality, content production programs lead to an inability to use this technology in education	0.907**
The lack of special education teachers' experience in applying augmented reality during the teaching process causes obscurity in using this technology.	0.856**
Costly smart devices and augmented reality applications are prominent obstacles to incorporating this technology in the educational process.	0.825**
Weak technological infrastructure is the reason for the inability to use augmented reality, to teach disabled students efficiently and effectively.	0.837**
Teachers are not convinced of the importance of augmented reality in teaching disabled students which contributes to the lack of its use.	0.925**
Informal use of augmented reality, in teaching disabled students leads to its lesser generalization.	0.907**

** Statistical significance is 0.01.

Table 6 reveals that all values of Pearson correlation coefficients for each paraphrase of the fourth dimension and its total score are statistically significant with (0.01). Which means phrases of the fourth dimension are highly valid. This indicates that the questionnaire is valid to achieve the Objectives of the research.

Stability of the study instrument

Cronbach's alpha coefficient was calculated for expressions of different questionnaire dimensions, the results were as below:

Table 7. Stability coefficient for resolution dimension.

Dimensions	Alpha Cronbach coefficient	Number of statements
Possibility of employing augmented reality, teaching disabled students in Riyadh	0.760	7
Willingness to apply augmented reality in teaching disabled students in Riyadh	0.803	7
Advantages of using augmented reality, teaching disabled students in Riyadh	0.898	7
Hurdles faced by special education teachers while using augmented reality during the teaching process in Riyadh.	0.953	7
Total resolution	0.881	28

All dimensions of the questionnaire have a stability coefficient alpha greater than 0.6, indicating the validity and correlation of the questionnaire statements. The high overall stability level further confirms its validity in achieving the research purposes and objectives.

Results

The first dimension: Possibility of using augmented reality whilst teaching disabled students in Riyadh.

Table 8. Summary Stats for Coherence of Phrases on Augmented Reality Use in Teaching Disabled Students in Riyadh

Response Expression	Mean	Standard deviation	Relative weight	Ranking	Level of consent
Using augmented reality in the classroom for disabled students.	3.025	1.132	0.605	4	Medium
I can create augmented reality content for the subjects I teach to disabled students.	2.987	1.019	0.597	5	Average
I do share with my colleagues, my experiences while employing augmented reality.	3.076	1.059	0.615	3	Average
Augmented reality contributes to improving the accomplishment level of disabled students.	3.177	1.010	0.635	1	Average
Augmented reality helps me easily teach a curriculum designed for disabled students.	3.152	0.921	0.630	2	Average
I share my augmented reality material with my colleagues.	3.025	1.132	0.605	4	Medium
The institution is interested in applying augmented reality in	2.987	1.019	0.597	5	Average

teaching disabled students.

Overall average 3.061 1.042 Average

The study on the ability to use augmented reality in teaching disabled students in Riyadh found that the phrase "augmented reality improves the success level of disabled students" had the highest relative weight of 0.635 and an average willingness level. The statements "I create augmented reality content for the subjects I teach" and "The school is keen on applying augmented reality in teaching disabled students" had the lowest relative weight of 0.597 and an average willingness level. All statements received an average approval level, indicating an average usage level of augmented reality in teaching disabled students among the study sample of special education teachers in Riyadh. The general average value was 3.061 with a standard deviation of 1.042, achieving the first sub-goal of the study and answering the first sub-question.

The second dimension is: Willingness to incorporate augmented reality in educating students with learning disabilities in Riyadh.

Table 9. Summary Stats for Willingness to Use Augmented Reality in Teaching Disabled Students in Riyadh

Response Statement	Mean	Standard deviation	Relative weight	Ranking	Eagerness level
The institution provides facilities for using augmented reality in teaching disabled students.	3.291	0.850	0.658	3	average
The school trains teachers to integrate augmented reality for teaching students with learning disabilities.	3.392	0.791	0.678	2	Average
School is working to provide smart devices designed for augmented reality to teach disabled	3.291	1.293	0.658	3	average

students.

The school urges teachers to utilize augmented reality to teach disabled students.	2.848	0.921	0.570	4	Average
The school promotes teacher collaboration to apply augmented reality in teaching disabled students.	3.405	1.149	0.681	1	average
Teachers are eager to apply augmented reality to teach disabled students.	3.291	0.850	0.658	3	Average
Teachers are keen to acquire training about applications of augmented reality to teach disabled students.	3.392	0.791	0.678	2	Average
General average	3.273	0.949	Average		

According to the study on the willingness of institutions to use augmented reality in teaching disabled students in Riyadh, the phrase with the highest relative weight of 0.681 and average eagerness is "Institution keenly encourages teachers to share their augmented reality experiences with each other". On the other hand, the phrase with the lowest relative weight of 0.570 and average approval is "Institution urges special education teacher to apply augmented reality while teaching disabled students". Phrases related to eagerness to use augmented reality in teaching disabled students in Riyadh received an average approval rating, indicating an average eagerness to apply augmented reality in teaching disabled students in Riyadh among the sample of special education teachers. The study fulfills the second sub-goal with a general average of 3.273 and a standard deviation of 0.949. Therefore, the second sub-question of the study is answered.

Third dimension: Benefits of employing augmented reality whilst teaching disabled students in Riyadh.

Table 10. Summary Statistics for Augmented Reality Benefits in Teaching Students with LD in Riyadh

Response Expression	Mean	standard deviation	relative weight	ranking	willingness
I found that incorporating augmented reality into teaching disabled students enhanced my teaching skills.	3.861	0.763	0.772	5	High
The employment of augmented reality in teaching disabled students saves a lot of time and effort.	4.076	0.764	0.815	3	High
Employing augmented reality provides a unique learning environment for disabled students.	4.354	0.734	0.871	1	High
Augmented reality contributes to the achievement of desired goals in special education.	3.987	0.840	0.797	4	High
Augmented reality improves communication between teachers and disabled students.	4.139	0.780	0.828	2	High
Augmented reality enhances disabled students' attention towards learning.	3.861	0.763	0.772	5	High

Augmented reality provides classroom and extracurricular activities while teaching disabled students.	4.076	0.764	0.815	3	High
Overall average	4.051	0.773	High		

Above table 10 shows that phrase “Employing augmented reality provides a unique learning environment for disabled students” is the most important statement having relative weight 0.871 with high eagerness. However, two statements “I found that incorporating augmented reality into teaching disabled students enhanced my teaching skills” and “Augmented reality enhances disabled students’ attention towards learning” were the least important with a relative weight 0.772 with a high eagerness. It is evident that statements of “advantages of using augmented reality in teaching disabled students in Riyadh” all received high eagerness. This demonstrates high awareness of the study sample members comprising special education teachers in Riyadh, about the advantages of using augmented reality in disabled students in Riyadh. General average was 4.051 with a standard deviation of 0.773, which is the achievement of the third sub-goal of the study. This satisfies the third sub-question.

Fourth dimension: Hindrances faced by special education teachers in using augmented reality to teach disabled students in Riyadh.

Table 11. Summary Stats for Hindrances in Special Education Teachers' Use of Augmented Reality in Riyadh

Response Statement	Mean	Standard deviation	Relative weight	Ranking	Eagerness
Lack of training in augmented reality while teaching disabled students, obstructs its use in educational process.	3.633	1.273	0.727	3	Average
Difficulty while using augmented reality and its	3.709	1.242	0.742	1	Average

content production results in inability to use it in education.

Special education teacher's lack of experience in augmented reality applications is a reason for difficulty in using it.

3.684	1.276	0.737	2	Average
-------	-------	-------	---	---------

Costly smart devices and augmented reality applications are obstacle in using Augmented reality in educational process.

3.595	1.325	0.719	4	Average
-------	-------	-------	---	---------

Weak technological infrastructure leads to inability to use augmented reality in teaching disabled students efficiently and effectively.

3.532	1.197	0.706	5	Average
-------	-------	-------	---	---------

Teachers' lack of understanding importance of augmented reality while teaching disabled students causes lesser use of augmented reality.

3.633	1.273	0.727	3	Average
-------	-------	-------	---	---------

Unofficial use of augmented reality, teaching disabled students leads to lesser generalized use.

3.709	1.242	0.742	1	Average
-------	-------	-------	---	---------

Aggregate average	3.642	1.261	average	
-------------------	-------	-------	---------	--

The study found that special education teachers in Riyadh had an average willingness towards using augmented reality for teaching disabled students, as indicated by the average ratings given to phrases related to obstacles faced by teachers. The aggregated average for this dimension was 3.642 with a standard deviation of 1.261, meeting the fourth sub-goal of the study. Overall, the attitude of special education teachers towards using augmented reality was also average, with an aggregated average of 3.507 and a standard deviation of 1.006, fulfilling the main objective of the study.

Discussion

The current research indicates that more investigation is necessary on the implementation of augmented reality technology in special education classes. According to the study's outcomes, teachers in Riyadh who specialize in special education demonstrate a moderate level of interest in incorporating augmented reality technology into their teaching methods for students with learning disabilities. These findings align with previous research by Farhan (2022), which suggests that teachers have a favorable disposition towards using augmented reality technology in their instruction.

The study underscores the significance of offering training programs for educators to encourage the integration of augmented reality technology in all educational facilities in Saudi Arabia. This proposal is bolstered by the research conducted by Solak and Cakir (2016), which revealed that teacher training played a vital role in the effective implementation of augmented reality technology in the classroom. Therefore, the current study suggests the necessity of training programs for teachers to promote the utilization of augmented reality technology in all educational institutions in Saudi Arabia, emphasizing the importance of providing professional development opportunities for educators to guarantee successful technology integration in the classroom.

Additionally, the study emphasized the importance of conducting further research to evaluate the effects of augmented reality technology on the

academic performance of students with learning disabilities and the performance levels of teachers. This suggestion aligns with the research of Al-Hussaini (2014), who advocated for additional investigation to determine the efficacy of augmented reality technology in enhancing academic outcomes for students with disabilities.

The study's findings can also be noted to have provided answers to the research questions that were posed. Specifically, the research investigated the attitudes of special education teachers towards the use of augmented reality technology in teaching students with learning disabilities in Riyadh. The study findings revealed that the teachers demonstrated a moderate level of inclination towards the use of technology, indicating a potential avenue for technological integration in special education classrooms. Moreover, the study highlighted the need for training programs for teachers and further research to assess the impact of augmented reality technology on academic performance.

However, it is important to acknowledge the limitations of the current study, such as the small sample size and the use of a self-reported questionnaire. These limitations may affect the generalizability of the study's findings and highlight the need for larger-scale studies with more objective measures to assess the effectiveness of using augmented reality technology in special education classrooms.

Pedagogical implications

The study has important implications for special education teachers, curriculum designers, and policymakers. To effectively use augmented reality technology in teaching students with learning disabilities, teachers need training on how to design and implement augmented reality activities that match the curriculum and target students' learning needs. Encouraging teachers to share their

experiences can help promote effective use of technology in the classroom. Curriculum designers should consider incorporating augmented reality technology into the curriculum to create an interactive and engaging learning environment. Policymakers should invest in research to investigate the impact of using augmented reality technology on the academic performance of students with learning disabilities. These actions can improve the educational outcomes of students with learning disabilities by enhancing the teaching and learning process with technology.

Limitations and Recommendations

This study has limitations that should be considered, including a small sample size of only 79 special education teachers from Riyadh, which may limit the generalizability of the findings to other countries. Self-reported data was also used, which may be biased or inaccurate. The long-term impact of using augmented reality technology in teaching was not investigated, and future research should explore its implementation sustainability over time.

To promote the use of augmented reality technology in education, it is recommended to raise awareness and provide support to educators and institutions across Saudi Arabia through training courses and awareness programs. Further research is needed to understand the impact of augmented reality technology on both teachers and students, especially for disabled students, and identify best practices for using it. Institutions should also provide necessary resources and facilities to support training and awareness programs, ensuring that teachers have the knowledge and skills to effectively integrate augmented reality technology into the classroom.

Conclusion

The study looked at how special education teachers in Riyadh use augmented reality to teach students with disabilities. The results showed that most teachers

are somewhat likely to use this technology, and they are willing to try it. The teachers also know about the benefits of using augmented reality in teaching. However, they face some challenges when using it. Overall, the teachers have a moderate attitude towards using augmented reality in teaching students with learning disabilities.

References

- Abdel Wahed, A.. (2015). Learning Disabilities: A Theoretical Study. *Journal of Studies in History and Archeology*, Vol. 2015, p. 50 (sup), p. 407-436.
- Al-Anazi, A. and Al-Failakawi, A.(2018). The degree of awareness of faculty members of the concept of augmented reality in the College of Basic Education at the Public Authority for Applied Education and Training in the State of Kuwait. *Journal of Educational Sciences*, vol. 26, p. 2, pp. p. 403-436. <https://search.emarefa.net/detail/BIM-933372>
- Al-Hussaini, M. (2014). The effect of using Reality Augmented technology in a unit of the computer course on the achievement and attitude of secondary school students, unpublished master's thesis, Umm Al-Qura University, Makkah Al-Mukarramah.
- Al-khresheh, M. H., Mohamed, A. M., & Asif, M. (2022). Teachers' Perspectives towards Online Professional Development Programs during the Period of COVID-19 Pandemic in the Saudi EFL Context. *FWU Journal of Social Sciences*, 16(2), 1-17. <http://doi.org/10.51709/19951272/Summer2022/1>
- Al-Otaibi, S., Al-Fraih, L., and Al-Balawi, H. (2016). A future vision for using Augmented Reality technology as an educational tool for integration children in kindergarten in the Kingdom of Saudi Arabia. *Journal of the Modern Education Association*, Vol. 8, p. 28, 59-99. Retrieved from <http://search.mandumah.com/Record/761574>

-
- Al-Rahili, L. (2021). Attitudes of teachers with learning difficulties towards the use of augmented reality in teaching in Medina. *The Arab Journal of Disability and Giftedness, The Arab Foundation for Education, Science and Arts, Egypt*, 5, 270-223, 18 <https://doi.org/10.21608/jasht.2021.197930>
- Al-Subaie, S., and Issa, J. (2020). The reality of using augmented reality technology from the point of view of primary school teachers in their schools. *The Arab Journal for Scientific Publishing*, 26, 50-75.
- Bressler, D. M., & Bodzin, A. M. (2013). A Mixed Methods Assessment of Students' Flow Experiences during a Mobile Augmented Reality Science Game. *Journal of Computer Assisted Learning*, 29, 505-517. <https://doi.org/10.1111/jcal.12008>
- Busra Y., Yenioglu, F., & Samed Y. (2021). Augmented reality for learning in special education: a systematic literature review, *Interactive Learning Environments*, 29, 1-17, <https://doi.org/10.1080/10494820.2021.1976802>
- Fadl, A., Al-Dress and Alaa S. (2020). Developing wisdom as an entrance to improve psychological resilience among mentally gifted secondary school students. *Journal of Special Education, Educational, Psychological and Environmental Information Center, Zagazig University*, 6(21), 83-170.
- Farhan, A. (2022). The reality of using augmented reality technology in early childhood from the point of view of teachers and supervisors in the city of Mecca. *The Arab Journal of Specific Education*, 6(22), 65-98. <https://doi.org/10.21608/ejev.2022.233120>
- Gutierrez, J, M. & Fernandez, M, D, M. (2014). Augmented Reality Environments in Learning, Communicational and Professional Contexts in Higher Education. *Digital Education Review*, NO. 26, December 2014 . <https://doi.org/10.1344/der.2014.0.61-73>
- Harper, D., Bowles, A. R., Amer, L., Pandža, N. B., & Linck, J. A. (2021). Improving Outcomes for English Learners Through Technology: A

- Randomized Controlled Trial. *AERA Open*, 7(1), 1-20.
<https://doi.org/10.1177/23328584211025528>
- Howorth, S. K., Rooks-Ellis, D., Flanagan, S., & Ok, M. W. (2019). Augmented Reality Supporting Reading Skills of Students with Autism Spectrum Disorder. *Intervention in School and Clinic*, 55(2), 71–77.
<https://doi.org/10.1177/1053451219837635>
- Kellems, R. O., Eichelberger, C., Cacciatore, G., Jensen, M., Frazier, B., Simons, K., & Zaru, M. (2020). Using video-based instruction via augmented reality to teach mathematics to middle school students with learning disabilities. *Journal of learning disabilities*, 53(4), 277-291.
<https://doi.org/10.1177/0022219420906452>
- Lee, S., Chang, H. and Liang, J. (2013) 'Current status, opportunities and challenges of augmented reality in education', *Computers & Education*, 62, 41-49.
- Mansour, N., Alshamrani, S.M., Aldahmash, A.H. and Alqudah, B.M. (2013) 'Saudi Arabian Science Teachers and Supervisors' Views of Professional Development Needs', *Eurasian Journal of Educational Research*, 51, 29-44.
- Mohamed, A. & Shaaban, T. (2021). The effects of educational games on efl vocabulary learning of early childhood students with learning disabilities: a systematic review and meta-analysis. *International Journal of Linguistics, Literature and Translation*, 4(3), 159-167.
<https://doi.org/10.32996/ijllt.2021.4.3.18>
- Mohamed, A. (2021). The Impact of Educational Games on Enhancing Elementary Stage Students' Acquisition and Retention of English Vocabulary. *Journal of World Englishes and Educational Practices*, 3(2), 67-76. <https://doi.org/10.32996/jweep.2021.3.2.6>
- Mohamed, A. (2022). *The Effectiveness of Using Augmented Reality Applications in Developing English Vocabulary Acquisition and Reading Comprehension Skill for Preparatory Schools Pupils*. (Published Ph.D. Dissertation), Ain Shams University, Egypt.
- Obaid, M. (2018 AD). The effectiveness of augmented reality in developing some skills of students with hearing impairments in the computer course in

- the preparatory stage and their attitudes towards it, unpublished master's thesis, Benha University, Faculty of Specific Education.
- Przybylski, A. K., Ryan, R. M., & Rigby, C. S. (2009). The Motivating Role of Violence in Video Games. *Personality and Social Psychology Bulletin*, 35(2), 243–259. <https://doi.org/10.1177/0146167208327216>
- Quintana, M., Valenzuela, E., & Arias, A. (2020). Augmented Reality as a Sustainable Technology to Improve Academic Achievement in Students with and without Special Educational Needs, *Sustainability* 12 (19), 1- 20. <https://doi.org/10.3390/su12198116>
- Quintero, J., Baldiris, S., Rubira, R., Cerón, J., & Velez, G. (2019). Augmented Reality in Educational Inclusion. A Systematic Review on the Last Decade. *Frontiers in psychology*, 10, 1835. <https://doi.org/10.3389/fpsyg.2019.01835>
- Shaaban, T. (2021). *Children and Learning Disabilities*, General Egyptian Book Authority, 1st Edition, Egypt.
- Shaaban, T. S., & Mohamed, A. M. (2023). Exploring the effectiveness of augmented reality technology on reading comprehension skills among early childhood pupils with learning disabilities. *Journal of Computers in Education*, 1-22. <https://doi.org/10.1007/s40692-023-00269-9>
- Solak, Ekrem & Cakir, Recep. (2016). Investigating the Role of Augmented Reality Technology in the Language Classroom. *Croatian Journal of Education*. 18. 1067. <https://doi.org/10.15516/cje.v18i4.1729>.
- Wojciechowski, R. and Cellary, W. (2013) 'Evaluation of learners' attitude toward learning in ARIES augmented reality environments', *Computers & Education*, 68, 570-585. <http://dx.doi.org/10.1016/j.compedu.2013.02.014>
- Wong, K., Teo, T. and Russo, S. (2013) 'Interactive whiteboard acceptance: Applicability of the UTAUT model to student teachers.', *Asia-Pacific Educational Research*, 22, 1–10. <http://dx.doi.org/10.1007/s40299-012-0001-9>
- Yoon, S., & Wang, J. (2014). Making the Invisible Visible in Science Museums Through Augmented Reality Devices. *University of Pennsylvania* 58 (1), 49-55. <https://doi.org/10.1007/s11528-013-0720-7>