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Comparisons of special education teachers and faculty's perceptions of employing augmented reality for pupils with intellectual disabilities

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Abstract

The purpose of the current study is to investigate the comparisons between faculty and special education teachers' views of the use of augmented reality with learners with intellectual disabilities. In recent years, the Saudi education minister has made many reforms to advance the use of assistive technology in the teaching of learners with intellectual disabilities. The design of descriptive research was methodologically used to gather data from a hundred and sixty-five faculty members from Taif University and ninety special education teachers from Taif schools through an electronic survey. The questionnaire is divided into two parts: the first part includes demographic variables, namely gender and academic experiences. The second part included statements that focused on the views of special education teachers and faculty members regarding the use of AR technology for students with ID. The findings showed that faculty have more agreeable perceptions compared to special education instructors in Saudi Arabia. Also, there was a significant impact on special education teachers' perceptions of using augmented reality for students with intellectual disabilities based on gender. However, years of teaching experiences did not impact the special education teachers and faculty perceptions of using augmented reality with students with intellectual disabilities. Thus, the implication of the study recommends that special education teachers and faculty members should be more exhibited in training courses emphasizing raising awareness on the utilization of augmented reality for students with intellectual disabilities within general and university education.

Keywords: Augmented reality, Faculty, Intellectual disabilities, Special education teachers.

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1. Introduction

In recent years, the Kingdom of Saudi Arabia has made many reforms to enhance the education of learners with intellectual disabilities (ID) through the adaptation of assistive technology [1]. Students with ID are currently utilizing various types of devices, including cognitive and hearing supports, VocieOver apps, and electrical assistive tools, which can help students with ID surf the internet, use them as academic resources, and take notes in various schools and centers in Saudi Arabia [1].

Assistive technologies aid students with ID in overcoming their academic challenges, and it is crucial for teachers to to enhance their understanding and utilization of these technologies [1]. The field of technology is constantly evoloving to incorporate new technologies like augmented reality (AR), which serve as an assistive and instructional tool for teachers working with students withID [2].

AR technology is software linking the actual world environment with items or virtual facts to support the user's identities through devices and contents in a combined approach [3]. Also, it is described as a technological tool that associates the actual life with technological information using different AR devices [4]. Currently, AR technology has been increasingly utilized for enhancing living and educational independence [5]. Past studies have been accomplished to explore the merits, challenges, and benefits of AR applications in education [6-10]. For instance, Garzón and Acevedo [11] found that AR effects can be reasonable on student's learning gains, but they can be more significant when the intervention incorporates AR means. Cakir and Korkmaz [12] highlighted the importance of structuring and enriching the education setting in a way that enables children with disabilities to acquire skills of life independence and other effective services, and they recommended the utilization of the advancement of AR to improve children's skills and environment.

2. Literature Review

2.1. The Utilization of Augmented Reality in Schools

Many teacher education programs are excessively integrating some technologies, such as AR, to aid the teaching of disabled students in classrooms [13]. AR is one of various media-combined learning applications that can be a supportive tool for the learning process and help students represent knowledge and information in a new and advanced way, which increases both teachers' and students' motivation to deliver meaningful learning and schooling environments [14].

Although Alqarni [15] believed that teachers of students with special needs had positive attitudes as their student's experiences positive contributions in their willingness, enthusiasm, motivation, and self-concept by using AR technology in learning sciences. They also believed that it is an innovative learning tool for students with disabilities as it enhances the fun of the learning environment, is permanent learning, and is beneficial to teaching other lessons Sulaimani and Bagadood [1]. Cihak, et al. [16] accomplished a research focusing on the implementation of video modeling-based AR technology in teaching the skills of brushing teeth for students with autism. They found that teachers were satisfied with using this tool to finish additional visual aids and suggest them to other educators as it increases the learning performance, motivation, independent learning, and social acceptance of students with disabilities [17] as well as the satisfaction of teachers, parents, and students with disabilities [18]. It is a fact that AR can offer numerous benefits to the students with ID in inclusive classrooms. To begin with, utilizing AR can reduce the dependence of students with ID on the assistance of their teachers [19]. Also, it can help teachers authentically teach academic skills to students with ID by guiding the learning environment through mobile technologies and devices [17]. In addition, AR can be an assistive and instructional technology based on the Universal Design for Learning (UDL) to allow students with ID to learn efficiently [17].

AR technology embodies the principles of UDL, a framework for planning effective teaching emphasizes engagement, action, and expression through a variety of representation methods [10, 12, 20]. There is a lot of support in scientific studies for the engagement of UDL principals to develop the accessibility of curriculum content for students with ID [21, 22]. Furthermore, teachers can enhance the learning outcomes of students with ID by utilizing strategy-based technology and pedagogy to facilitate their access to the general curriculum [23]. As a result, teachers can have multiple options, enabling them to display information to meet the needs of students with disabilities if curriculum materials are digitally formatted [22].

2.2. The Utilization of AR in Higher Education

The utilization of AR in university education is not limited to students with low achievement; it can be a helpful technology for students with ID. The development of AR technology in higher education has benefited many underachieving students and provided valuable support to college students with ID [24]. Their study found that AR interventions improved the daily living skills of three young adults with ID. They pointed out that their usage of AR intervention was beneficial to making all students with ID independent in the university and helpful to boost their social acceptance and inclusion within the university residency.

AR technology is not only supportive of the social acceptance of college students with ID, but it can also be an important element in the progression of social skills [20]. They systematically investigated the implications of social skills for students with ID through the engagement of AR or Virtual Reality (VR) technology; which is defined as a simulation of three-dimensional (3D) setting that allows students to discover and interrelate with a virtual environment that approximates reality. They pointed out that AR or VR technology had impacted the social skills of students with ID in higher education. However, they found that many studies had limitations in terms of the study methods, the possibility of generalizing findings, and measures. Despite the capabilities that AR technology gives to students with ID, it is important to employ it to support their living and interaction needs with all university students. McMahon and Walker [20] conducted a study on three college students with ID, examining the impact of utilizing AR technology in conjunction with Google Maps and

virtual maps on their transportation. The purpose of the study was to measure the student's abilities in terms of making decisions when traveling to unknown places. The results of the study showed that students were able to travel more successfully through AR technology than through Google Maps or even paper maps, and their skills in navigating between sites improved significantly [20].

Navigation is a specific skill related to the ability to find locations that require people to be able to make decisions when traveling McMahon and Walker [20]. McMahon, et al. [17] carried out study on three college students with ID, examining the impact of utilizing AR technology in conjunction with Google Maps and virtual maps on their transportation. The study showed an improvement in their abilities to move comfortably when moving on foot between the corridors of the university campus. Also, students with ID can use their "iPhone" device, as it is a popular portable device that frees them from many of the restrictions found in some assistive technologies, which may carry some kind of stigma when they travel [17].

Application-based AR technology can also be used to carry out daily life requirements to identify food allergens that worry many individuals with ID [20]. For example, using the Red Laser application on mobile devices is of great benefit in identifying the substances and elements that cause allergies in different foods [20]. Although it may take six weeks to teach students with ID about identifying the substances and elements that cause food allergies and how to avoid them, it is worth noting the importance of training these students and increasing their skills for living independently [20].

Educationally, the integration of AR technology into higher education institutions has increasingly grown to support secondary school students with ID to acquire modern knowledge, concepts, and classifications in various fields of science [17]. It gives faculty members alternative options when teaching students with intellectual and developmental disabilities when asking them to solve mathematical verbal questions [22]. Moreover, many faculty members believe that employing AR technology is educationally beneficial because it allows students with disabilities to generate innovative ideas [25]. It can also be educationally beneficial because it increases learning success and stimulates the desire to complete tasks [20]. It aids in comprehending information, improving orientation, and engagement [26].

2.3. The Purpose of the Study

Previous research has shown that no studies have examined the disparities in faculty members' and special education teachers' perspectives about using augmented reality (AR) technology with pupils who are intellectually disabled in the Saudi educational system. Therefore, the current study aims to investigate the perception of faculty members and instructors in the Kingdom of Saudi Arabia regarding the use of augmented reality (AR) technology with their intellectually disabled students.

2.4. The Importance of the Research

The study's significance lies in the many benefits that AR technology has for the educational progress of students with ID in the Saudi education system. First and foremost, AR technology is considered one of the modern technologies that has gained widespread popularity among many educators because it provides them with innovative ways to teach students with ID. Secondly, providing decision-makers in universities and schools benefit from the familiarity of faculty members and special education teachers with AR applications suitable for students with ID. Third, comparing the opinions of special education teachers with those of faculty members is a good opportunity for them to repair their weaknesses and increase their strengths regarding the use of AR technology for students with ID. As a result, the research addressed three crucial questions to close the current study's research gap. These questions center on contrasting the perspectives of faculty members and special education teachers to promote the integration of students with ID into suitable educational institutions: (1) What differences exist between the perspectives of faculty members and special education teachers regarding the use of augmented reality technology for students with ID? and (2) Is there any evidence of statistically significant variations in faculty and teacher perspectives of AR with students with ID because of the gender variable? (3) Are there any statistically significant changes in the faculty and teachers' perceptions of using AR with students with ID due to their teaching experiences?

3. Materials and Methods

Research design, research population, instrument, validity and reliability tests.

3.1. The Design of Research

This study employed descriptive survey research to gather information about perceptions and comparisons between faculty members and special education teachers regarding the use of AR technology for students with ID in the city of Taif, Kingdom of Saudi Arabia. This inductive method is considered one of the methods that is useful in collecting data and learning about the different conditions among a group of participants.

3.2. Research Population

The current study randomly selected 255 instructors to participate and complete an online questionnaire. 165 faculty members from Taif University and 90 special education teachers from Taif schools participated, and they had different variables related to teaching experiences and gender. The faculty members participated from Taif University, Colleges of Humanities and Education; however, special education teachers participated from three inclusive schools.

3.3. Instrument

We distributed an electronic questionnaire to special education teachers in Taif schools and faculty members at Taif University in Saudi Arabia to compare their perspectives on the use of AR technology for students with ID. Also, the survey contained two main parts: the beginning part included demographic variables, namely gender and academic experiences. The second part included statements that focused on the views of special education teachers and faculty members regarding the use of AR technology for students with ID. Additionally, using a Likert scale to answer these statements, (1) indicated strongly disagreeing, while (5) strongly agreed. After preparing the questionnaire we sought permission from Taif University's Deanship of Scientific Research to conduct the study on participants in accordance with scientific research ethics. Also, there was a question in the questionnaire regarding participants' consent to participate.

3.4. Validity and Reliability

After translating the questionnaire from English to Arabic, five translation and disability experts evaluated it. On the Arabic version of the survey, the translators suggested a few modifications. Disability specialists also reviewed the questionnaire and confirmed its readiness for distribution. Finally, the reliability of the questionnaire was examined on 30 participants using Cronbach's alpha, and the score was 0.86.

4. Data Analysis

The current study aims to investigate faculty members and special education instructors' perspectives regarding the usage of augmented reality technology in children with ID. We performed both descriptive and inferential analyses quantitatively on the present research using SPSS 23. We posed the initial question to compare the perceptions of special education teachers and faculty members regarding the use of AR technology for students with ID. The researcher identified the responses to this question by calculating the mean and standard deviation. The second question focused on how the gender variable affected the perceptions of AR among students with ID among faculty members and special education teachers. We used an independent-sample t-test gender-based perception of professors and special education instructors for this particular question. The third inquiry focused on how different special education instructors' and faculty members' perspectives on utilizing augmented reality technology with students with ID differed depending on their prior teaching experiences. A one-way between-groups analysis of variance was used to compare the perspectives of faculty and special education instructors based on their respective teaching experiences on this particular topic.

5. Results

Table 1 displays the results of faculty and special education instructors' in Saudi Arabia regarding the use of augmented reality (AR) technology with students who have intellectual disabilities. According to the mean score of special education teachers' perceptions (M = 3.26, SD = 1.194), there is no consensus among them about the usage of augmented reality (AR) technology with pupils who have intellectual disabilities in Saudi Arabia. Faculty opinions are in agreement about the employment of augmented reality technology with students with ID in Saudi Arabia, as evidenced by the mean score of faculty perceptions (M = 4.03, SD =.773). This suggests that faculty members' perceptions are more favorable than those of special education teachers.

Table 1.
The averages and standard deviations of the opinions of faculty members and special education instructors regarding AR.

N	Items	Faculty responses			Teachers' responses		
		Mean	Standard deviation	Scale response	Mean	Standard deviation	Scale response
1	I find using the different augmented reality programs to be simple.	3.79	1.253	Agree	3.14	1.625	Neutral
2	AR creates instructional materials for children with ID with skill.	4.18	1.089	Agree	3.22	1.436	Neutral
3	I feel competent when it comes to using AR-designed educational materials to teach pupils with ID.	3.76	1.159	Agree	3.07	1.279	Neutral
4	Before use AR with students who have IDs, instructors must receive training.	4.48	0.860	Strongly agree	3.97	1.194	Agree
5	AR is usable in classrooms where students have disabilities.	4.33	0.913	Strongly agree	3.33	1.563	Neutral
6	AR can help children with ID learn more effectively.	4.33	1.038	Strongly agree	3.30	1.394	Neutral
7	AR helps students with ID learn and acquire critical competencies.	4.27	1.026	Strongly agree	3.14	1.526	Neutral
8	Schools are equipped and have the infrastructure needed to use augmented reality.	2.91	1.426	Neutral	2.91	1.077	Neutral
9	The AR apps that are available are expensive.	4.09	0.936	Agree	3.27	1.498	Neutral
10	Tablets and other augmented reality gadgets are pricey.	4.18	0.871	Agree	3.23	1.615	Neutral
Total		4.03	0.773	Agree	3.26	1.194	Neutral

Table 2.
Comparisons of special education instructors and faculty perceptions of employing AR technology based on gender variable.

Teachers' perceptions										
Gender	**N**	**Mean**	**Std. deviation**	**Std. error mean**	**Equal variances assumed**	**Levene's test for equality of variances**				
						F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**
Male	38	3.24	1.296	0.210		1.414	0.238	0.107	88	0.915
Female	52	3.27	1.127	0.156	Equal variances not assumed			0.104	72.9	0.917
Faculty perceptions										
Gender	N	Mean	Std. deviation	Std. error mean	Equal variances assumed	Levene's test for equality of variances				
						F	Sig.	t	df	Sig. (2-tailed)
Male	105	3.93	0.837	0.082		0.779	0.379	2.333	163	0.021
Female	60	4.22	0.612	0.079	Equal variances not assumed			2.536-	153.2	0.012

Table 2 presents a comparison of the gender-based perceptions of the special education teachers by performing an independent-sample t-test. Male special education teachers' scores (M = 3.24, SD = 1.29) and female special education teachers' scores (M = 3.27, SD = 1.12; t (88) = -.107, p =.932, two-tailed) do not differ significantly. We also use an independent-sample t-test to compare their perceptions of gender with those of the faculty. The outcomes show that the scores of the male and female faculty members are not significantly different (M = 3.93, SD =.837) or different (M = 4.22, SD =.612, t (88) = -2.333, p =.033, two-tailed). This suggests that neither special education instructors' nor faculty members' opinions on utilizing AR with students with ID are influenced by gender.

Table 3.
Comparisons of special education instructors and faculty perceptions of employing AR technology based on teaching experiences variable.

Teachers' perceptions					
Between groups	8.406	2	4.203	3.086	0.051
Within groups	118.500	87	1.362		
Total	126.907	89			
Faculty perceptions					
Between groups	1.205	2	0.602	1.008	0.367
Within groups	96.862	162	0.598		
Total	98.067	164			

Table 3 shows the impact of special education instructors' teaching experiences on their perspectives of utilizing augmented reality (AR) technology with their ID students byusing a one-way between-groups analysis of variance. The results also reveal three groups of special education teachers divided based on the length of time they had been teaching (group 1: less than 29 years, group 2: 30-44 years, and group 3: 45 years and above). The results for the three teaching experience groups show statistically significant differences (F (2, 87) = 3.08, p =.05. As for the actual difference in mean scores between the groups, it is rather moderate, even though it reaches statistical significance. We determine the effect size to be 0.06 using eta squared.

However, we also divide the faculty into three groups based on the duration of their teaching experience (group 1: 29 years or less, group 2: 30-44 years, and group 3: 45 years and above). This suggests that special education teachers with less experience, as opposed to those with more experience, have more positive opinions of augmented reality. The three teaching experience groups' scores did not differ statistically significantly at the p <.05 level from those of special education teachers (F (2, 162) = 1.008, p =.367). This finding indicates that the teaching experience variable significantly influences the opinion of the special education instructors about using augmented reality (AR) for students with intellectual disabilities, while faculty perceptions are unaffected.

6. Discussion

The current study aims to compare the views of Saudi faculty members and special education teachers regarding the use of AR for students with ID. The analysis of this particular study's data shed light on how special education teachers and faculty experienced the AR involvement of students with ID. According to Jwaifell [14] teachers view augmented reality (AR) as a useful tool in contemporary teaching; therefore, they have positive opinions about using it with students who have ID. Firstly, it was found that many faculty members have favorable perceptions compared to special education teachers who neither agree nor disagree on utilizing AR with their students with ID. These results align with a previous study by Alqarni [15] who found that instructors have an optimistic disposition towards teaching their students by using AR technology and developed a lot of meaningful skills such as self-concept, enthusiasm, and motivation. In comparison to faculty members, Khatoony and Altınpulluk [27] believed that faculty members hold positive perceptions toward using AR technology as it can enhance motivation and learning achievements among learners. Second, the current study demonstrated that special education instructors' opinions toward utilizing augmented reality (AR) for students with ID were unaffected by their gender. This result was consistent with Alalwan, et al. [28] who believe that the majority of instructors, both male and female, have positive opinions about augmented reality (AR) and how important it is for students with ID to

study. However, this result was contradicted by Jwaifell [14] who demonstrated a statistical difference between male and female teachers using AR with students with ID. Specifically, female teachers perceived using AR more than male special education teachers performed. This is explained by the fact that female teachers are more social than male teachers [14]. The current study's results indicate that gender of the faculty did not influence their use of AR with ID students. This finding was consistent with Alsadoon and Alhussain [29] who mentioned that there was no distinction between the faculty members' genders regarding their familiarity with and usage of AR technology with college students. Finally, the current study's results demonstrated statistical differences in the use of augmented reality (AR) by special education teachers with students with intellectual disabilities, with those with less experience having more experience with AR. Alalwan, et al. [28] confirmed this finding and believed that this is explained by the fact that teachers with more experience mostly intend to use a teaching technique and do not like to change it. However, the results of the current study showed that there were no variations in the faculty members' perspectives of their teaching experiences when it came to using augmented reality (AR) for students with ID. This suggests that faculty members with both large and small teaching experiences had the same views regarding using AR with students with ID. This outcome was in line with the findings of Alsadoon and Alhussain [29] who discovered no disparities in faculty members' opinions about how university students use augmented reality technology.

7. Conclusion

The purpose of the current study was to compare how faculty members and special education teachers used augmented reality (AR) technology with students who had intellectual disabilities. According to the current study, faculty members' perceptions are more positive than those of special education instructors. Furthermore, the study found that years of teaching experience significantly influenced the attitudes of special education teachers towards the use of AR with ID students. Teachers' and faculty members' opinions about using augmented reality (AR) with ID students are unaffected by gender.

8. Implications

It is recommended that male and female educators undertake training courses on the employment of AR apps and become familiar with their importance in the learning process. The outcomes of the present study could be beneficial for both faculty members and teachers. Firstly, the results of this research can provide significant benefits to university faculty and teachers, enabling them to better support their students by incorporating AR technology into their educational practices. Also, both faculty members and teachers can be knowledgeable and aware of the merits of AR technology. Moreover, the outcomes of the current study might be advantageous for students, as they can allocate their time to achieving their learning goals with AR technology. In other words, learners can apply AR technology as a valued learning instrument that opens up valuable learning opportunities.

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