Research Article

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The Reality of Using Augmented Reality Technology by Secondary School Female Teachers in Abha City in Teaching from Their Point of View

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Abstract

This study attempts to identify the reality of using AR technology by secondary school female teachers in Abha City from their perspective and attitudes towards AR. The study used a questionnaire as an instrument for data collection. The study utilized the descriptive-analysis approach, and the sample comprised 298 teachers, who were selected randomly. The study indicated that the reality of using AR in teaching for secondary school female teachers achieved a high score of (3.82) from their point of view. Furthermore, the study showed that female teachers' attitudes toward using AR were positive and with a high degree (4.32). Additionally, the study showed that there were statistically significant differences (0.05 α ≤) in the reality of secondary school female teachers' use of AR in teaching due to the variable (Age and Courses). However, there were no statistically significant differences in the use of AR among female teachers because of the variables (Years of experience and Specialization). Based on the most important results, the study recommended the necessity to train female teachers to produce, design, and employ augmented reality content in the educational process and to work scientifically to overcome the obstacles they face in utilizing augmented reality technology in their teaching.

Keywords: *Augmented reality; Educational process; Female teachers; Attitudes, Abha city*

1. Introduction

Augmented Reality (AR) technology is one of the main pillars of the twenty-first century in its perception of the educational process. It represents one of the features of the new digital development in today's world, as it is based on integrating digital information with the user's environment in real time. Virtual data is merged with the natural world to enhance the environment with various details, whether texts, pictures, videos, or sounds. The purpose behind using AR is defined by multiple goals in different fields, including the teaching and learning process at all levels and its various applications. AR can be defined as a growing field of technology where the real world

is modified and enhanced through computer-generated visuals and sounds. It can also be used by many modern technological devices and tools, such as computers, tablets, and smartphones, through wearable components like glasses and helmets. According to Kurubacak and Altinpulluk (2017), AR allows the integration of virtual reality based on the information and the physical reality of the real world.

The emergence of AR technology dates back to the late 1960s when Tom Caudell coined the term AR in the early 1990s (Lee, 2012); this technology has seen rapid growth, which has been accelerated since 2010, likely due to mobile computing power and functionality improvements; this led to the integration of AR systems into mobile devices and made this technology available to more users. Accordingly, AR technology received wide attention from specialists in various fields, such as medicine, tourism, entertainment, and education (Akçayir & Akçayir, 2017). AR technology has been used in education to design educational tools to enrich learning and teaching experiences (Garzón et al., 2017).

AR technology has been widely used in various fields, including education. AR technology in education is one of the different forms of e-learning, which in its applications to the teaching and learning process, depends on many learning theories. The use of AR in education has increased over the past decade (Sudirman et al., 2022). AR has also changed the interaction of the learning process in the classroom and has positively affected the learning process (Al-Shahrani, 2021). Trupiano (2020) mentioned a complementary relationship between learning theories and AR, indicating that the behavioural approach had integrated effectiveness with technology. AR in terms of the behavioral preferences of digital learners, as individuals have shown, with the ubiquitous digital computing, patterns of behaviour that predict their behavior and interests. In this context, Al-Shahrani (2021) emphasized that AR is an emerging trend in teaching that enables instructors to give learners different experiences easily using their mobile devices such as smartphones and tablets. AR technology has been recognized by numerous educational institutions around the world as one of the most promising technologies (Ibáñez et al., 2018), and has become a milestone in the educational process and will enhance teaching and learning in the coming years (Al-Shahrani, 2021; Lafargue, 2018; Ibáñez et al., 2018). Instructors can easily and quickly transfer concepts to learners who study learning materials supported by AR applications (Sahu et al., 2021).

It is ideal for integrating virtual reality technology with a realistic environment. Garzón et al. (2017) revealed that AR technology had reached a high level of maturity and has proven to be widely effective in educational settings. Lafargue (2018) confirmed that this AR has vast applications in education. Thus, AR can provide smooth interaction between the real and virtual worlds, improve learning capabilities, motivate learners, develop problem-solving, and increase academic achievement (Chiang et al., 2014). Al-Shahrani (2021) confirmed that AR technology improves learning outcomes and makes teaching and learning more exciting and motivating.

Several educational studies emphasized the importance of AR and its role in education. For instance, López-Belmonte et al. (2020) indicated that AR technology in the academic context helps learners understand abstract educational meanings and terms, simplifies educational content, and motivates students to learn. In addition, AR increases motivation for learning and academic achievement (Chen et al., 2019; López-López; Belmonte et al., 2020) and raises students' self-efficacy in a way that contributes to the development of their higher-order thinking skills (Al-Mashaikhiya, Mai, 2022). AR also increases knowledge, skills acquisition, interaction, and cooperation among students (Huang et al., 2019; Turan et al., 2018) and reduces levels of cognitive load, helping them learn abstract and complex materials (Turan et al., 2018; López-Belmonte et al., 2020).

Despite the benefits achieved by the use of AR technology in education, there are several challenges facing its application and limiting its use in the educational process. These challenges are represented in the need for the necessary devices to employ AR in educational institutions, the difficulty of designing 3D shapes, and the need for sufficient conviction and enthusiasm for this type of education by school workers. In addition, there is a scarcity of specialists and experts who can apply AR technology and a lack of good interaction by some learners with this technology (Dunleavy

et al., 2009); and technical issues (Akçayir & Akçayir, 2017), and resistance of teachers (Lee, 2012), as well as information overload (Akçayir & Akçayir, 2017; Turan et al., 2018).

2. Problem Statement

Given the importance of AR in the educational process, it was of great importance that teachers be able to use and activate it in teaching, which will only be achieved by identifying their training needs and disseminating the necessary programs in educational technologies until the desired goal is achieved. Many conferences have emphasized the need to pay attention to training teachers in the academic field on technological innovations and techniques and qualifying them to utilize such technology optimally; for example, the Conference on E-learning and Distance Education (2015) in the city of Riyadh and the Fifth Conference for Teacher Preparation (2016) in Umm Al-Qura (Al-Sabei & Essa, 2020).

The success of using AR in the educational process depends on male and female teachers' awareness and possession of knowledge and skills. The success of its employees depends on the degree of understanding of male and female teachers of its concept, as it provides an innovative space by transforming constructivist theory into a tangible reality that can be applied (Shea, 2014); thus, it is necessary to use and deal with it.

Accordingly, several studies were conducted that dealt with AR technology. They, consequently, recommended its use in education, including Al-Hamid (2020), which was concerned with designing training programs for female teachers to train them to teach using augmented reality. Al-Rehaili (2021) also focused on encouraging teachers' specialists with learning difficulties and increasing their attitude toward using AR in teaching. Despite these benefits of using AR in education, some challenges must be addressed to obtain the best AR technology and ensure the appropriate integration in education. Undiscovered application areas still exist in which AR systems can help expand possibilities and improve learning processes (Al-Shahrani, 2021; Garzón et al., 2017). In light of the recommendation of Al-Hamid (2020), Al-Shehri (2019), and Al-Hwaiti and Al-Balawi' (2019), the researcher decided to conduct a study of the reality of female teachers' use of AR in different stages and other regions.

2.1 Research Questions

1. What is the reality of using AR technology among secondary school female teachers?
2. What challenges do secondary school teachers face when using AR in teaching?
3. What proposals may contribute to improving the effectiveness of using AR in teaching from the point of view of secondary school teachers?
4. What are the attitudes of secondary school teachers toward using AR technology in teaching?
5. Are there statistically significant differences at the significance level in the reality of using AR technology among secondary school teachers due to the variable (Age - Years of experience -Specialization - Training courses)?

3. Significance of Study

This study seeks recommendations and proposals from secondary school teachers that would help employ AR to meet the interests and needs of teachers. In addition, it aims to improve the level of female teachers' possession of AR skills to reach the level of their male and female counterparts to enhance the quality of the educational process.

4. Review of Literature

Al-Mashaykhiya and Mai (2022) identified the extent to which female teachers practice AR in teaching science to develop higher-order thinking skills (analysis, evaluation, and creativity) among students. The study results concluded that the degree to which female teachers practice AR to develop higher-order thinking skills was moderate. The study also showed statistically significant differences in the reality of female teachers' practice of this technique in developing higher-order thinking skills according to the variable of teaching experience in favour of experienced female teachers.

Several studies emphasized that the lack of awareness of AR is one of the most critical challenges and obstacles facing male and female teachers in employing AR in the educational process (Al-Hamid, 2020; Al-Shehri, 2019; Al-Thaqafi & Al-Shahrani, 2022). Al-Shehri (2019) concluded that female teachers' awareness of AR and its uses in teaching was low, with an average of (1.29). The results also revealed statistically significant differences at the significance level ($\alpha \leq 0.05$) due to teaching experience in favour of teachers with teaching experience of fewer than seven years. Al-Enezi (2019) recommended the need to generalize the use of AR in various academic curricula while spreading awareness of the importance of its use in teaching. Additionally, Abdel-Hamid (2019) indicated the effective use of AR in developing the knowledge and skill side of learners.

Teachers' attitudes toward using AR technology are a primary factor in determining the success or failure of this technology in the educational process. Knowing teachers' attitudes toward AR is more important than knowing its applications, tools, programs, and production. It is necessary to evaluate users' attitudes and identify the positive and negative ones to find out the essence of the problem and work to overcome it by training and qualifying them to use AR in their teaching effectively. Consequently, it should not be limited to introducing AR to the educational and learning process; instead, it must be accompanied by a focus on the human aspects, the most important of which are teachers' attitudes towards AR technology (Al-Shahrani, 2021).

Therefore, several studies have investigated the opinions of male and female instructors regarding their attitudes toward AR technology and the factors that affect it. Abdel-Rida and Al-Rashidi (2022) revealed a moderately positive attitude among the respondents toward AR technology. They indicated that several hindrances face the employment of this technology from their point of view, as the technical obstacles came in the first place, followed by the human barriers, then the societal obstacles, and finally the material obstacles. The results also showed statistically significant differences between the averages of the sample's estimates about the attitude toward AR in favour of those with less than five years of service.

Al-Rehaili (2021) identified the attitudes of teachers with learning disabilities toward using AR in teaching, the impact of some variables on that, and the reality of their knowledge of AR applications. The study sample consisted of (97) male and female teachers, and the study found high attitudes of teachers with learning disabilities towards using augmented reality in teaching. The results also indicated that the truth of the knowledge of teachers with learning disabilities about applications of AR is average.

Al-Hwaiti and Al-Balawi (2019) explored the attitudes of female mathematics teachers towards using AR in teaching mathematics to identify obstacles to its use from their point of view and to know the impact of variables (teaching experience, courses in the use of AR) on their attitudes. The study was based on the descriptive analytical approach, and its sample consisted of (55) female teachers who were chosen randomly. The study concluded that the female teachers' attitudes towards the use of AR in teaching were positive and to a high degree, and its results also showed that there are obstacles to a high degree that prevent female teachers from using augmented reality, as the general arithmetic mean was (3.98), as well.

5. Methods

The study adopted the descriptive analytical approach because of its suitability for the current research and procedures. It monitors the study phenomenon in reality, analyzes and interprets previous literature, and then proposes appropriate solutions.

5.1 Population and Sample

The population of the current study included all secondary school teachers in the city of Abha in the Asir region for the second semester of the academic year 2022, and their number was (1059) teachers. The study sample was chosen randomly, consisting of (298) teachers, and the sample is distributed according to the following Table.

Table 1. Distribution of study sample members according to study variables, levels, and corresponding percentages

Demographic	Categories	F	%	Demographic	Categories	*F*	*%*
Age	Less than 25	8	2,7	Specialization	Islamic studies	80	26.8
	35-25	42	14.1		Arabic language	32	10.7
	45-36	154	51.7		English language	24	8.1
	45+	94	31.5		Computer sciences	11	3.7
Years of experience	Less than 5 years	38	12.8		Mathematics	35	11.7
	From 5-10	37	12.4		Scientific subjects (physics, biology, chemistry)	42	14.1
	More than 10 years	223	74.8		Social subjects (history, geography, sociology, psychology)	32	10.7
Training courses	Less than 5	188	63.1		Arts (artistic, family, physical)	42	14.1
	From 5-10	54	18.1				
	More than 10	56	18.8				

5.2 Instrument of the study

After reviewing the educational and scientific sources and studies related to the subject and variables of the study, the questionnaire was formed in its initial form, as it included four dimensions. The first dimension consisted of 11 items measuring the use of AR by teachers. The second dimension consisted of 10 items measuring secondary school teachers' challenges when using AR in teaching. The third dimension included (8) items measuring the most important proposals for improving the level of using AR among secondary school teachers. The fourth dimension included (12) items measuring the attitudes of secondary school teachers toward using AR in teaching, and the number of items in its initial form was (41). The five-point Likert scale was used to obtain the responses and to give the respondents a greater opportunity to express their opinion freely and accurately, according to the following degrees of approval: (strongly agree, agree, neutral, disagree, strongly disagree).

5.3 Validity of the instrument

The apparent validity of the questionnaire was verified by presenting it in its initial form to the judges in educational technology. The judges were requested to evaluate each of the strengths of the study instrument's items in terms of clarity and soundness of wording. Moreover, the extent to which it

belongs to the dimension under which it was classified, then modified by addition or deletion according to the arbitrators' opinions. The modifications suggested by the arbitrators were made to the questionnaire to reach the final version of the questionnaire.

The validity of the internal consistency of the study instrument was confirmed by calculating the Pearson correlation coefficient by calculating the correlation between the degree of each of its items and the total degree of the dimension to which the item belongs. It is clear from Table (2) that all Pearson correlation coefficients were statistically significant at a significant level (0.05), which indicates a high degree of validity of the internal consistency of the study instrument and the correlation of the questionnaire with its dimensions.

Table 2. The internal consistency of the study instrument and its stability

Dimension	Correlation	Sig.	Cronbach's α
The reality of using AR in teaching for secondary school teachers.	**0.706	0.000	0.952
Challenges faced by secondary school teachers when using AR in teaching.	**0.580	0.000	0.865
Proposals that may contribute to improving the effectiveness of using AR in teaching from the point of view of secondary school teachers.	**0.684	0.000	0.902
Teachers' attitudes towards the use of AR from the point of view of secondary school teachers.	**0.736	0.000	0.936

5.4 Reliability of the instrument

To verify the reliability of the instrument, Cronbach's Alpha Coefficient was used as an indicator of the stability of the internal reliability of the instrument. The coefficients were between 0.865-0.952, as indicated in Table 2, which means that the instrument's stability is good for the current study.

6. Results and Discussion

6.1 Results of the first question

To answer the first question, the mean scores, standard deviations, and ranks were calculated for the responses of the study sample according to the dimensions of its questionnaire. The results showed that the reality of using AR in teaching for secondary school teachers is very satisfactory, as shown in the following Table:

Table 3. The reality of using AR in teaching for secondary school teachers

N	Items	M	SD	Rank
1	I use appropriate AR applications to achieve educational goals.	4.1409	92128.	1
2	I can create AR content specific to the subject I teach.	3.5872	1.14037	11
3	I explain to the students how to use AR.	3.6577	1.08415	10
4	I use AR for homework	3.6779	1.09032	9
5	I use AR in-class activities	3.8255	1.05557	6
6	My use of AR is reflected in improving the student's performance.	3.9899	0.96220	2
7	I use flashcards to communicate the content well	3.9799	0.95677	3
8	I use AR to build virtual content	3.7081	1.05983	8
9	I encourage the students to build content based on AR applications	3.8591	1.04137	5
10	I am developing my skills by participating in many AR courses.	3.8591	1.04460	4
11	I am developing my skills via Open Educational Resource (OER) platforms	3.7685	1.03966	7
	Total	3.8231	0.85220	

To verify the reality of secondary school female teachers using AR in teaching, the following hypothesis was formulated:

Ho: The reality of using AR in teaching for secondary school teachers is generally satisfactory. To make sure of that, we used the t-test, which is shown in the Table below.

Table 4. Results of the t-test to validate the first hypothesis

Dimension	T value	Sig
The reality of using AR in teaching for secondary school teachers	16.67	.000

It is clear from the data in the above Table that the value of the significance level is less than (0.05), as the results of the (T) test came (16.67); this indicates that augmented reality in teaching is very satisfactory for secondary school teachers. This result is because the use of augmented reality in the second stage has reached an acceptable and satisfactory level, which is due to the increase in the interest of female teachers in this technology because of its novelty, the high level of skills necessary to use it in the educational process, the tendency towards receiving training courses for training on this technology, and the availability of own techniques in most schools. This result agreed with Mundy et al. (2019), which showed that most teachers have sufficient knowledge of AR and feel pleasure and motivation when using it. The results differed with Tzima et al. (2019), which showed that the use of AR in teaching was not well known, as well as the study Al-Najdi (2022), which demonstrated the failure of teachers to employ AR in their educational activities.

6.2 Results of the second question

It is clear from the statistical analysis of the second question that there are many difficulties and main challenges that limit the application of AR in educational activities, as shown in the following Table:

Table 5. Challenges faced by secondary school teachers when using AR in teaching

No.	Items	M	SD	Rank
1	I see that the reluctance of some female teachers to use AR due to a lack of awareness of it and knowing how to employ it limits their use.	4.2517	0.82903	8
2	Lack of training programs for the use of AR.	4.4060	0.74280	5
3	The language of AR applications, mainly in English, poses a challenge to their use in education.	4.3490	0.76035	6
4	Female teachers must be convinced of AR's importance and usefulness in education.	3.8893	0.95231	10
5	The material cost of acquiring smart devices and AR applications	4.3289	0.74710	7
6	Lack of free programs and applications for AR	4.4060	0.66634	4
7	Students' lack of skills in using AR.	4.2248	0.87220	9
8	Poor school infrastructure and overcrowded classrooms.	4.5235	0.69712	3
9	Poor internet connection and technical equipment in the school environment	4.6577	0.65414	1
10	The educational burden of female teachers hinders their use of AR.	4.5570	0.66040	2
	Total	4.3594	0.51339	

The following hypothesis was formulated to verify the challenges that secondary school teachers face when using AR in teaching: *Ho: There are no challenges that secondary school teachers face when using AR in teaching*. To verify this, we used the t-test shown in the Table below.

Table 6. Results of the t-test to validate the second hypothesis

Dimension	T value	Sig
Challenges faced by secondary school teachers when using AR technology in teaching.	45.710	0.000

It is clear from the data in the above Table that the value of the significance level is less than (0.05), as the result of the (T) test was (45.710); this indicates that there are challenges facing secondary school teachers when they use AR in teaching. This result is attributed to the absence of official use of AR in secondary schools, the need for more sufficient and continuous training for female teachers on its use, the low awareness of the importance of its use among female teachers, and its impact on the educational process. This finding is consistent with previous studies (Al-Anazi, 2019; Al-Shehri, 2019; Al-Zein, 2020; Al-Hwaiti & Al-Balawi, 2019; Akçayir & Akçayir, 2017; Tzima et al., 2019; Turan et al., 2018), which investigated the challenges faced by teachers. When using augmented reality, training was one of the main challenges that hindered it. Accordingly, the use of AR must be generalized in various academic curricula while spreading awareness of the importance of its use in teaching, as recommended by previous studies such as (Al-Anzi, 2019; Al-Hamid, 2020; Al-Shehri, 2019; Al-Thaqafi & Al-Shahrani, 2022).

6.3 Results of the third question

To answer this question, the mean scores, standard deviations, and ranks of the responses of the study sample were extracted according to the dimensions of their questionnaire. It is clear from the statistical analysis that all proposals contribute to improving the effectiveness of using AR in educational activities from the point of view of secondary school teachers, as shown by the following Table:

Table 7. Proposals that may contribute to improving the effectiveness of using AR in teaching from the point of view of secondary school teachers

No.	Items	M	SD	Rank
1	I suggest holding courses and training workshops on how to use AR and how to use it in the educational process.	4.634	0.57187	2
2	I believe that educating female teachers about the importance of using AR and its advantages is one factor that improves its use in education.	4.577	0.59381	3
3	I suggest presenting developed countries' experiences in using AR in the educational process.	4.483	0.66772	7
4	I suggest providing smart devices for students that support AR applications.	4.5268	0.67241	6
5	I believe that providing the necessary infrastructure for the use of AR contributes to its good use in education.	4.5537	0.63469	4
6	I suggest strengthening and supporting internet connection in the school environment.	4.6946	0.52291	1
7	I suggest motivating female teachers who use AR by adding points for them in their professional performance.	4.4765	0.81719	8
8	I suggest developing strategies and methods for how to activate AR in the educational process.	4.5302	0.66724	5
	Total	4.5596	0.49981	

To verify the extent of the proposals that may contribute to improving the effectiveness of the use of AR in teaching from the point of view of secondary school teachers, the following hypothesis was formulated: Ho: The proposals may not contribute to improving the effectiveness of using AR in educational activities from the point of view of secondary school teachers, and to make sure from

that we used Test-t, which is shown in the Table below.

Table 9. Results of the t-test to validate the third hypothesis

Dimension	T value	Sig
Proposals that may contribute to improving the effectiveness of using AR in teaching from the point of view of secondary school teachers	53.87	0.000

It is clear from the data of the above Table that the value of the significance level is less than (0.05), as the results of the (T) test came (53.87), and this indicates that the proposals contribute to improving the effectiveness of the use of AR in educational activities. Accordingly, it was decided to reject the hypothesis. The result is that the proposals include, in essence, the creation of physical, technological, and human conditions, which is the basis for building educational environments based on AR technology that will enable female teachers to overcome the challenges that they may face when using AR in teaching, by training them on how to employ this technology effectively. Technology in teaching and increasing their motivation to use it would contribute to improving the effectiveness of this technology in general education.

6.4 Results of the fourth question

To answer this question, the mean scores, standard deviations, and ranks of the responses of the study sample were extracted according to the dimensions of the questionnaire. It is clear from the statistical analysis that the female teachers' attitudes toward the use of AR in teaching were positive, as shown in the following Table:

Table 9. Attitudes of secondary school teachers toward the use of AR technology in teaching

No.	Items	M	SD	Rank
1	I believe that the use of AR helps achieve the goals of the learning process.	4.3389	0.63767	7
2	I think AR makes learning more fun.	4.4732	0.65722	2
3	I feel that AR is characterized by a flexible learning environment in terms of time and space.	4.2114	0.80754	9
4	I think the use of AR improves the learning process.	4.3591	0.64244	6
5	I have a feeling that AR raises students' motivation toward learning.	4.4564	0.63546	4
6	I believe that AR stimulates self-learning in the learner.	4.3289	0.69576	8
7	I see that AR contributes to sharing ideas and interacting with students.	4.4060	0.66634	5
8	I believe that the use of AR contributes to the professional development of female teachers.	4.2047	0.78820	10
9	I feel that AR is more effective than traditional education.	4.1040	0.89099	12
10	I believe that AR helps deliver content to students with minimal effort.	4.1074	0.89624	11
11	I feel that AR adds new options to the teacher in presenting the study material.	4.4564	0.56834	3
12	I believe that exchanging experiences in the use of AR increases the chances of using it in teaching.	4.4966	0.64744	1
	Total	4.3286	0.55052	

The following hypothesis was formulated to verify the extent of female teachers' attitudes towards using AR: Ho: There are no positive attitudes of secondary school teachers towards using AR. The (T) test, shown in the Table below, was used to validate it as follows:

Table 10. Results of the t-test to validate the fourth hypothesis

Dimension	T value	Sig
Attitudes of secondary school teachers toward the use of AR technology in teaching	41.660	0.000

Female teachers and their awareness of the importance of the role played by AR in the teaching process, and their desire to learn this technology and its various applications and want to learn more about the options and services provided by this technology. It is clear from the data in the above Table that the value of the significance level is smaller than (0.05), as the results of the (T) test was (41.660). This result coincided with Gündoğmuş et al. (2016), which indicated positive attitudes among teachers toward augmented reality, and Al-Shahrani (2021), which showed positive attitudes among students toward the use of augmented reality.

6.5 Results of the fifth question.

To answer this question, the One-Way ANOVA test was applied to find differences in the teachers' responses about the reality of using AR among secondary school teachers due to the variable of age, as shown in the Table below.

Table 11. The results of "One-Way ANOVA" for the differences in the responses of the study sample according to the age variable

	Sum of squares	Freedom Value	Eta square	F value	Sig.
Between groups	9.717	3	3.239	4.623	0.004
Within groups	205.978	294	0.701		
Total	215.695	297			

It is clear from the previous Table that there are statistically significant differences between the averages of the study sample responses about the total score according to age. The significance level reached (0.004), meaning it is statistically significant. The Table below shows the difference in the responses of the study sample regarding their estimation of the reality of using AR techniques for secondary teachers, as the younger female teachers (less than 25 years old) showed that their responses differed negatively from the rest, which is shown in the Table below.

Table 12. The different responses of the study sample about their appreciation of the reality of using AR techniques for high school teachers

Age	Age	Differences in the mean scores	Sig.
Less than 25	35-25	*-1.17316-	0.000
	45-36	*-1.04191-	0.001
	+45	*-95455.-	0.002
35-25	Less than 25	*1.17316	0.000
	45-36	13125.	0.368
	+45	21861.	0.160
45-36	Less than 25	*1.04191	0.001
	35-25	-13125.-	0.368
	+45	08737.	0.426
+45	Less than 25	*95455.	0.002
	35-25	-21861.-	0.160
	45-36	-08737.-	0.426

*Statistically significant

This result can be attributed to older teachers having more experience than their younger colleagues. Therefore, they may have a deeper understanding of the importance of employing AR in teaching and benefiting through its various applications.

To answer the part on the years of experience, the One-Way ANOVA test was applied to find differences in the teachers' responses about the reality of using AR technology among secondary school teachers due to the number of years of experience variable, as shown in the Table below as follows:

Table 13. The results of "One-Way ANOVA" for the differences in the responses of the study sample according to the variable of years of experience

	Sum of squares	Freedom Value	Eta square	F value	Sig.
Between groups	1.760	2	0.880	1.214	0.299
Within groups	213.935	295	0.725		
Total	215.695	297			

It is evident from Table (13) that there are no statistically significant differences between the averages of the study sample's responses about the total score according to the number of years of experience, as the level of significance reached (0.299), which means that it is not statistically significant. The result also indicates that the study sample's responses are close to their estimate on the reality of the use of AR technology among secondary school teachers, despite the different years of experience they have obtained.

To answer the part on the role of the teachers' specialization, the One-Way ANOVA test was applied to find differences in the teachers' responses about the reality of using AR among secondary school teachers due to the specialization variable taught by the teacher, as shown in the Table below as follows:

Table 14. The results of "One-Way ANOVA" for the differences in the responses of the study sample according to the variable of specialization

	Sum of squares	Freedom Value	Eta square	F value	Sig.
Between groups	3.894	7	0.556	0.762	0.620
Within groups	211.801	290	0.730		
Total	215.695	297			

It is clear from the previous Table that there are no statistically significant differences between the averages of the study sample responses regarding the total score according to the specialization taught by the teacher, as the significance level reached (0.620); This means that it is not statistically significant. The result indicates that the responses of the study sample were close to their appreciation of the reality of using AR technology for secondary school teachers, despite the difference in the specialization taught by the teacher. This result can be attributed to the fact that the application of AR techniques in the educational process is not limited to a specific specialization or field, as there is an agreement in the opinions of the study sample, as applications of AR can be employed in all fields and subjects in general.

To answer the part on the role of the training course as a variable, the One-Way ANOVA test was applied to find differences in the teachers' responses about the reality of using AR technology among secondary school teachers due to the variable of programs and training courses in AR technology, as shown in the Table below as follows:

Table 15. Results of "One-Way ANOVA" for the differences in the responses of the study sample according to the training courses variable

	Sum of squares	Freedom Value	Eta square	F value	Sig.
Between groups	21.051	2	10.526	15.952	0.000**
Within groups	194.644	295	0.660		
Total	215.695	297			

It is clear from the previous Table that there are statistically significant differences between the averages of the study sample's responses about the total score according to the number of programs and training courses in augmented reality, as the significance level reached (0.000), which means that it is statistically significant.

The Table below shows the difference in the study sample's responses about their estimate of the reality of the use of AR for secondary school teachers, where the teachers showed the least number of programs and training courses in AR technology (less than five courses), their responses differed from the rest negatively, shown in the Table below.

Table 16. The difference in the responses of the study sample shows their appreciation of the reality of using AR techniques for high school teachers

Training courses in AR technology	Training courses in AR technology	Differences	Sig.
Less than 5	Less than 5	*-38724.-	002.
	More than 10	*-65612.-	000.
From 5-10	Less than 5	*38724.	002.
	More than 10	-26888.-	084.
More than 10	Less than 5	*65612.	000.
	More than 10	26888.	084.

Naturally, there are differences in the responses of the study sample in favour of the teachers—women who have received more training courses related to using AR technologies in the educational process. This result may be due to the degree of mastery of work in applying AR that requires different skills. These skills must be developed among teachers of different specializations, and this can only be done through courses and training programs.

7. Conclusions and Recommendations

The study reached the following conclusions. The reality of using AR in teaching among secondary school teachers was very high, with a mean score of (3.82). Some challenges hinder the application of AR in educational activities, the most important of which is the school environment's poor internet connection and technical equipment. All proposals improve the effectiveness of using AR in educational activities from the point of view of secondary school teachers, with a high degree and an arithmetic mean of (4.55).

The female teachers' attitudes towards using AR in teaching were positive and to a high degree, with a mean score of (4.32). There are statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of using AR among secondary school teachers due to the variable (age, training courses). There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the reality of using AR among secondary school teachers due to the variables (Years of Experience and Specialization).

Based on the above findings, the study proposes a set of recommendations.

- Holding training courses and workshops for general education teachers to make them aware of the use of AR and how to use it in the educational process.

- The need to train female teachers to use AR technology provided that the training includes the actual employment of this technology in achieving the desired educational goals.
- Encouraging software designers to provide AR applications that provide integrated scientific content; To achieve educational feasibility effectively and efficiently.
- Distributing official guides by educational departments dealing with the skills of producing AR to guide teachers.
- Work scientifically to overcome the obstacles facing the implementation of AR technology and its employment by female teachers, whether technological, human, or administrative.
- Interest in conducting more studies and research on the reality of using AR in other educational stages.

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