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The Effect of Using Augmented Reality Technology on Learning Development for Beginners in Fencing

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Abstract

Through the authors teaching Practical aspect of the fencing lectures noticed that there are traditional teaching methods in teaching physical education For Fencing Beginners, and the authors wanted to use modern technology "augmented reality" in teaching the Fencing skills, From here lies the importance of the research in designing a technical program to keeping pace with technological development in teaching methods Through to identify The effect of using augmented reality technology on learning Development for beginners in fencing. The authors used the experimental method, The sample was chosen intentionally "from First-year students of the Faculty of Physical Education at Sadat City University" and the authors used the statistical program to address the data, where The most important conclusions were that the educational program using augmented reality has a positive impact on learning and the level of performance of Development skill for beginners in fencing, with statistically significant differences in the post-measurement of the experimental group.

Keywords: ***Augmented reality, Technological development, Fencing***.

Introduction

The world has now witnessed a tremendous revolution in technology and wide scientific progress, Interest in advanced technology has increased in the development of the educational process, Modern and new programs have been produced to improve the educational process and not rely on the traditional method of teaching and employ modern aids for education, especially in the sports field.

Technology has become one of the basic elements for developing educational systems and improving the various tasks of the teaching and learning process through systems theory

the concept of systems means that it is a group of parts that interact together to achieve one or more goals, and the systems method is the infrastructure for educational technology and the use of the systems method In the field of education, to change the perception of modern technological means, such as computers, educational television, closed circuit television, and educational films, as they are merely educational means, to consider them as organic elements in the education and training technology system as a system within the general educational system. (Weston, 2018; Yu, 2014)

The E-learning process aims to create an interactive teaching and learning environment through various electronic technologies that help improve inputs and raise teachers 'capabilities in the employing world has experienced a remarkable revolution in technology and significant scientific advancements, There is a growing interest in leveraging advanced technology to enhance the educational process Modern programs have been developed to improve education, moving away from traditional teaching methods and incorporating innovative tools This is particularly evident in the sports field, where modern aids are being employed to enrich the learning experience. These technologies formulate educational content and activities in a way that meets scientific and educational standards and develops students' tendencies and positive attitudes towards more education and learning.

Educational technology Provides the opportunity for learners to communicate and interact with each other during learning, and the communication theory emphasizes digital learning via networks and the use of computer technology and the Internet in learning. (Abu Khutwa, 2018)

Hence the idea of this study is To determine the reality of Digital Learning and E-platforms in the educational process and to explain the reasons that lead to the inability of students and faculty members to manage and organize study subject programs effectively during the educational process, with the authors to develop some guidance or solutions that can be followed to manage and organize study subject programs in a way effective, and thus help workers and those on the educational process in general to know the needs of students and faculty members and then, according to the results of the study can help in good planning and preparing for the sports programs and subject curricula and implemented based on Scientific results.

Within these methodologies should be highlighted augmented reality (AR), which in recent years has been of great importance in the educational context, as demonstrated by numerous experiences that have been put into practice since AR applied to university students promotes understanding, reflection, creativity, participation, and innovation, but above all, motivation, since it allows for a complete perception and interaction with the real world through complementary information provided by a technological device, favoring teaching and learning processes and the progress of ubiquity in educational centers. (Juhaňák, 2019)

Where augmented reality interfaces allow users to see the real world at the same time as virtual imagery attached to real locations and objects. In an AR interface, the user views the world through a handheld or head-mounted display (HMD) that is either see-through or overlays graphics on video of the surrounding environment, AR interfaces enhance the real-

world experience, unlike other computer interfaces that draw users away from the real world and onto the screen.(Billinghurst, 2002)

The AR has different stages that increase the complexity of the effect they produce and require the use of more sophisticated devices as they increase: level 0 refers to hyperlinks that are generated by QR codes and can be easily activated from a mobile phone, level 1 uses markers, level 2 requires the use of a GPS locator, level 3 manages to add virtual elements to the real space through special glasses and level 4 requires the use of thermal fingerprints and contact lenses, This techno pedagogical tool used in education allows for an endless number of possibilities that favor significant learning by students through the approach of contexts to the classroom with which they can interact, as well as visualization.(Lee, 2021; El Kabtane et al., 2020)

The key to the success lies AR lies in the number of advantages It offers for education, Where Numerous authors have shown that it significantly increases student motivation since it allows the content of study subjects to be presented in an attractive and novel way, awakening interest and curiosity in the teaching process, which is a fundamental prelude to achieving significant learning.(Vasilevski & Birt, 2020)

Physical education is an educational subject that also benefits greatly from the versatility of AR, since it allows students to improve their performance, considering its different dimensions: it facilitates understanding of the theoretical part of its contents, accelerates the development of complex motor skills, and improves students' spatial orientation and interpersonal skills. (Gallego-Lema et al., 2017)

In addition, there is an improvement in cognitive performance, such as memory, attention, concentration, and linguistic competence, plus a series of benefits that affect emotional intelligence, such as well-being, self-control, and sociability. (Muñoz-Cristóbal et al., 2017)

If we add to the above benefits the contribution to the development of digital competence, which is so important for the development of the current society, the high value of AR as a pedagogical tool in physical education becomes evident. (Moreno-Guerrero et al., 2020)

Although AR has garnered much research attention in recent years, the term AR was given different meanings by authors s. Additionally, AR could be created by utilizing and connecting various innovative technologies (e.g., mobile devices, wearable computers). However, like many innovations, the educational values of AR are not solely based on the use of technologies but are closely related to how AR is designed, implemented, and integrated into formal and informal learning settings. To provide insights into opportunities offered by AR.(Wu et al., 2013)

Fencing is one of the sports that made authors s use auxiliary means in the educational process and training to facilitate their task in reaching the learner's mind to produce some exercises to gain information and knowledge without feeling bored and frustrated. (Farag Al Arabey, 2019)

According to the aspects mentioned above the authors believes that the transition to exclusive E-learning can highly affect the educational process and students' and faculty members' perception of the use of the online environment in the process of teaching and learning, and these ideas stand at the basis of this research.

The authors has used modern technology in education to bring the student out of the traditional reality to an augmented reality similar to the real reality of performance, which enables the student to interact With him for the presence of sound, image, and three-dimensional animations that enter it in an almost real world, affecting and being affected by it so that the educational process is completed optimally on the one hand, and the other hand authors s in the field of fencing did not address the use of augmented learning environments as an educational method to know their effect on teaching and teaching fencing decisions where It is a practical attempt to search and reach the best results for the educational process.

Given the above, it would be advisable to put into practice new teaching methodologies that include the use of technology as a pedagogical resource and to be able to offer updated training by the reality of the 21st-century student, There is no doubt that we are facing a digital society, which is why one of the priority goals of the current education system should be to equip classrooms with technological supplies that guarantee the use of ICTs in the teaching and learning processes. In this case, teaching does not revolve around the teacher or the content of the subject, but rather around the students and the tasks that are put into practice to promote learning.

This research was an attempt to experiment and to know the impact of modern technology on Fencing which is one of the sports that needs to build a broad base of young people because they are the basis of the future and the champions of tomorrow and motivate them to reach the best performance and a high level of acquiring basic skills in the sport of fencing.

Through reviewing previous Arabic and Foreign studies such as the study of (Farag Al Arabey, 2019) & (Mohamed Youssef et al., 2022) & **(**Bicen & Bal, 2016) & (Pérez-López & Contero, 2013) & (Taha, 2018) & (Bassem bin Rafea, 2023) & (Saeed, 2023) & (Dr. Naif, 2024). These studies called for attention to training and qualifying Teachers to use electronic educational platforms, encouraging them to use them, addressing deficiencies in educational platforms and removing obstacles, to improve the quality of education and achieve educational effectiveness**.**

The current study aims to know the effect of augmented Reality Technology on learning ''La Development'' skill for beginners in fencing

Study Hypotheses:

1. There are statistically significant differences between the means of the post-measurements between the experimental and control groups in favor of the post-measurement of the experimental group in learning La Development skill in fencing sport.

2. There are statistically significant differences between the means of the post-measurements between the experimental and control groups in favor of the post-measurement of the experimental group in the level of cognitive achievement in fencing sport.

Materials and Method

The author used the experimental method for its suitability to the nature of the research.

Participants

They were first-year Sport Science students, University of Sadat City, second semster of 2023/2024, they were (160) students that were devided into two groups, "experimental and control", each of (75) students , add to (10) students for the pilot study.

Table (1) shows the homogeneity of the two groups members in the growth, and physical tests variables, as the value of the skewness coefficient is between (± 3), indicating the moderation of the distribution of the sample members in these variables.

Table 1 The homogenety of the participants (N=160)

N	Variables		measurement Unit	mean	Median	Std. deviation	skewness
Growth variables							
1	Length		Cm	175.84	175.00	5.23	0.60
2	Weight		Kg	72.21	72.00	6.71	0.60
3	age		year	19.36	19.00	0.65	1.15
Physical variables							
4	Rection time		Sec	1.85	2.00	0.26	- 1.38
5	Translational speed		M/Sec	4.06	4.00	0.91	0.14
6	Balance	R	Sec	48.34	49.00	7.06	- 1.13
7		L	Sec	21.48	21.00	6.45	0.21
8	Co-ordication		Sec	4.53	5.00	1.14	- 0.05
9	Agility		M/Sec	14.31	14.00	1.25	- 0.05
10	Flexibility		Cm	4.61	5.00	1.02	- 0.71

The Equivalence of the participants groups:

Table (2) shows that there are no statistically significant differences between the two groups in growth variables and the physical tests, which indicates their equivalence in these variables.

The authors reviewed the special characteristics and abilities that characterize the stage, where the players were chosen from the same community and have the same characteristics in terms of (height, age, weight, and intelligence), as well as the level of skillful performance.

Table 2 The significance of the differences between the experimental group - control group in (growth variables - physical variables) N1=N2=75

N	Variables		measurement Unit	experimental group		control group		Differences	T .Test
				M	ST	M	ST		
Growth variables									
1	Length		Centimeter	175.71	5.58	175.51	4.89	0.20	0.23
2	Weight		Kg	71.20	7.35	72.73	6.00	-1.53	-1.40
3	age		year	19.37	0.71	19.35	0.60	0.03	0.25
Physical variables									
4	Rection time			1.89	0.24	1.83	0.29	0.06	0.63
5	Translational speed			4.21	0.93	3.96	0.89	0.25	1.70
6	Balance	R	S	49.39	6.40	47.17	7.60	2.21	1.93
7		L	S	21.19	6.67	21.36	5.94	- 0.17	- 0.17
8	Co-ordication			4.63	1.33	4.44	0.92	0.19	1.00
9	Agility		M/S	14.39	1.41	14.31	1.03	0.08	0.40
10	Flexibility		Centimeter	4.83	0.89	4.58	0.93	0.25	1.61

*Tabular value at (0.05) and a degree of freedom (148) = 1.979

Procedures

Forms and tests

1. Student Measurement Registration Form for Growth Variables.
2. Student Measurement Registration Form for Physical Tests.
3. A form to evaluate students' performance in stabbing skills.
4. The cognitive achievement test which is designed by Mohamed Diab (2023) was used to measure the cognitive achievement of basic skills of fencing beginners.

The Educational Program

After reviewing references and studies related to the current topic, a group of experts in physical education have been asked to answer a questionnair including the content and skills. In order to identify the required basic skills in fencing for this group and to achieve its goal of being free of mistakes.

1- Objective of the program

It is the provision of educational content for Development skill in fencing to contribute to helping the epee beginner develop their skills and create an atmosphere of enthusiasm, excitement, and interaction between the players.

2- Designing and organizing content

The authors asked a programmer to produce 3D video of "La Development" skill in Foil fencing in order to use it as the augmented reality that involved in the educational program.(Figure 1).

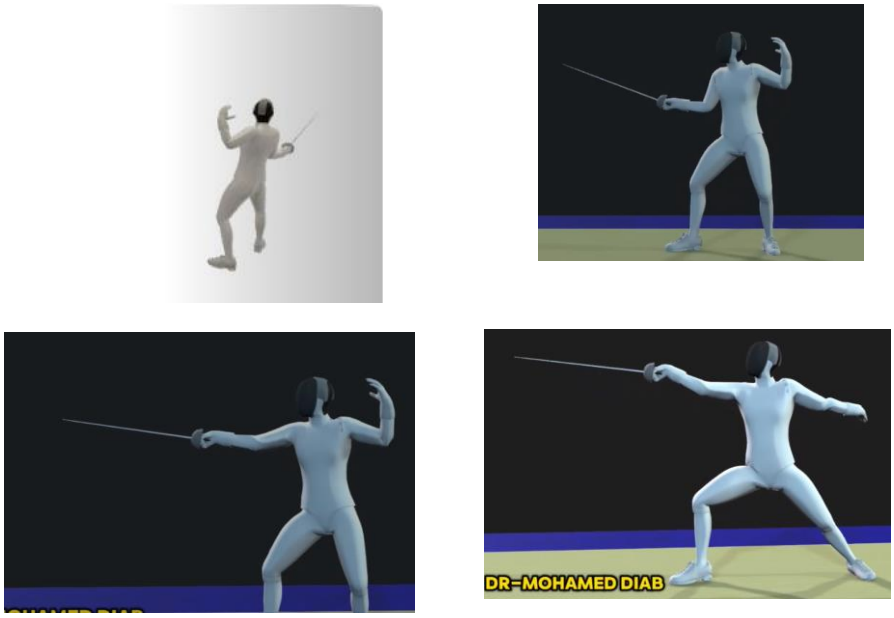

Figure 1. Augmented realty technology video of "La Development Skill "

Table 3. The Time distribution of aspects of the educational program using augmented reality technology

M	Parameter	Number and Duration		
1	weeks	(10) weeks		
2	educational units per week	One Unit		
3	educational units of the program	(10) Educational Units		
4	Unit duration per educational unit during the application of the program	Time	On normal days	During Ramadan month
		Units	5 units	5 units
		Time	(90) minutes per unit	(75) min per unit
5	Unit duration per week	Time	On normal days	During Ramadan month
		Units	unit	unit
		Time	(90) minutes	(75) min

Applying the educational Program

Pre- measurements

The pre-measurement was conducted on Monday, February 19, 2024, and Tuesday, February 20, 2024. The measurements were taken on the main sample (experimental-control)

for the research, consisting of 150 students, on the fencing hall courts at the Faculty of Physical Education, Sadat City University, in growth variables (age - height - weight) and some physical variables in fencing to achieve equivalence between them.

Main Study

The educational program was implemented from Monday, February 26, 2024, to Monday, May 6, 2024, using the augmented reality educational program for the experimental group and the usual teaching method for the control group.

Post measurements

The post-measurement was conducted on Monday, May 13, 2024, and Tuesday, May 14, 2024. The measurements were taken on the primary sample under study (experimental - control) consisting of 150 students, at the fencing hall courts of the Faculty of Physical Education, Sadat City University.

Tools and devices

- Medical scale
- The (rastometer) device for measuring length
- The ruler graduated in centimeters
- Distance measuring tape "in centimeters"
- Cones
- Numbered circles
- Stopwatch
- Camera
- Adhesive tape
- Mobile phones
- Dueling arena
- Whistle

Statistical Analysis

The appropriate statistical analysis were as follows: (mean - median - standard deviation - skewness - Pearson's simple correlation - split-half - Cronbach's alpha - t-test for significance of differences)**.**

Results and Discussion

First the results of the first hypothises which discuss the statistically significant differences between the mean of the post measurements between the experimental and control groups in learning Development skill in fencing sport .

Table (4) showed that there are t-test values for the experimental and control research groups in measuring the skill performance level of the skill tests under investigation were greater than the tabulated values at a significance level of (0.05) and degrees of freedom (148), indicating that there are statistically significant differences between the research groups in favor of the post-measurement of the experimental group.

Table 4. The significance of the differences between the post-test measurements of the experimental and control groups in the stabbing skill (n1=n2 = 75)

M	Skill	experimental group Post-measurement		control group Post-measurement		Differences	T .Test
		mean	SD	mean	SD		
1	La Development	6.92	0.69	4.53	0.50	2.387	24.154

* Tabular value of "T" at (0.05) and a degree of freedom (148) = 1.979

It is shown from Table (4) that the calculated value of “T” is greater than the value of the tabular “T”, indicating the existence of statistically significant differences between the means of the post-test measurements of the Development skill fencing

The authors attributes this result to the fact that using the augmented reality method performed effective skill improvement the fencing, which had positive results on the performance of the beginner level after the end of the learning period and that the use of augmented reality made it easier for beginner to assimilate skills and educational content, and it led to the consolidation of skill in the minds of players and helped to communicate information easily and easily and watching typical educational videos Help raise the level of skills.

That agrees with studies of (Farag Al Arabey, 2019) & (Mohamed Youssef et al., 2022) & **(**Bicen & Bal, 2016) & (Pérez-López & Contero, 2013) & (Taha, 2018), where the results of these studies indicated a significant superiority of the experimental group, which used augmented reality (AR) technology and similar techniques over the control group, which used the traditional teaching method (verbal explanation and practical demonstration), in favor of the experimental group in the level of skill performance for the skills under investigation.

Thus, the first hypothesis was verified, which states " There are statistically significant differences between the mean of the post measurements between the experimental and control groups in Favor of the post measurement of the experimental group in learning Development skill in fencing sport ".

Second, the results of the statistically significant differences between the mean of the post measurements between the experimental and control groups and the level of cognitive achievement in fencing sport.

Table (5) showed results that t-test values for the experimental and control research groups in of the level of cognitive achievement were greater than the tabulated values at a significance level of (0.05) and degrees of freedom (148), indicating that there are statistically

significant differences between the research groups in favor of the post-measurement of the experimental group.

Table 5. The significance of the differences between the two-dimensional measurements of the research groups in the level of cognitive achievement (n1=n2=75)

M	Test	experimental group Post-measurement		control group Post-measurement		Differences	T .Test
		mean	Std. deviation	mean	Std. deviation		
1	Cognitive achievement test	35.267	2.606	27.280	3.182	7.987	16.817

* Tabular value of "T" at (0.05) and a degree of freedom (148) = 1.979

It is shown from Table (5) that the calculated value of "T" is greater than the value of the tabular "T", indicating the existence of statistically significant differences between the means of the post-test measurements of the cognitive achievement in fencing.

Where the authors attributes these results to the well-organized and systematic planning of the educational program using Augmented Reality (AR) technology in a scientifically appropriate manner for the age group under study. Additionally, the application of AR technology in education provides learners with the opportunity to view three-dimensional visual models, which clarify all parts and stages of motor performance easily and engagingly through active interaction with them by the learners. This has led to providing learners with a substantial amount of knowledge, aiding their understanding, comprehension, and cognitive achievement.

That agrees with studies of (Bassem bin Rafea, 2023) & (Saeed, 2023) & (Dr. Naif, 2024), where the results of these studies indicated a significant superiority of the experimental group which used augmented reality (AR) technology and similar techniques over the control group which used the traditional teaching method (verbal explanation and practical demonstration), in Favor of the experimental group in the level of skill performance for the skills under investigation.

Thus, the first hypothesis was verified, which states " There are statistically significant differences between the mean of the post measurements between the experimental and control groups in favor of the post measurement of the experimental group in the level of cognitive achievement in fencing sport ".

Conclusion

Considering the objectives and assumptions of the research and based on what the research results have shown, and within the limits of the characteristics of the sample, the measurements that were carried out, and the statistical treatment that was used, the following conclusions could be reached:

1- The use of the educational program employing augmented reality (AR) technology positively affected the performance level of Development skill for beginner fencers (first-year students at the Faculty of Physical Education, Sadat City University).
2- The use of the educational program employing augmented reality (AR) technology positively affected the cognitive achievement level of beginners in fencing (first-year students at the Faculty of Physical Education, Sadat City University).
3- Using augmented reality technology helps overcome the large number of students and achieve the maximum benefit from the educational process.

Recommendations

Based on what was reviewed of results related to the importance of augmented reality as a new technique for visual stimuli and the extent to which augmented reality and its use in the educational process relates to cognitive and skill aspects, the authors recommends the following:

1. technology in the educational process through the availability of smartphones for students to teach motor skills in fencing.
2. Implementing the educational program using augmented reality (AR) technology for fencers at different age levels.
3. Raising awareness among teachers, trainers, and faculty members about the importance of using modern technologies in education through specialized training courses at universities, which enriches their knowledge of modern technologies and their application in the educational process.

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