The Effect of an Educational Program Based on the 3D Glasses as a Technological Innovation on the Academic Achievement and Attitude towards E-Learning

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Abstract
The research aimed to identify the effectiveness of an educational program using 3D glasses as a technological innovation on academic achievement and attitude towards e-learning in science in the preparatory stage. The research relied on the analytical descriptive approach and the semi-experimental approach. The research tools were the achievement test and the scale of attitude towards e-learning. An educational program was designed and produced using 3D glasses. The study sample consisted of 60 students from the second grade in the preparatory stage at the Rural Jeddah School. The research concluded to the following results: There was a satistically sigificant difference at the level of sig. (0.05) among the -mean scores of the experiemtal and control group students in the post assessment atthe level of achievement in favor of the experiemental group and therewas a satistically sigificant difference at the level of sig. (0.05) among mean scores of the experiemtal and control group students in the post assessment at the level of attitude towards e-learning in favor of the experiemental group. And it was found that the positive effect of the 3D educational program for improving the level of achievement and the attitude towards e-learning for the students. The program allowed the experimental group students to practice self-learning, interaction, and achievement according to the individual differences among them.

Keywords:
educational program, 3D glasses, technological innovation, achievement, the trend towards e-learning

1. Introduction

The school is an educational environment that aims to educate learners in a comprehensive way. Due to the rapid technological developments, it is natural to modify the school's aims to be developed, from using the traditional methods to the technological innovations. Because of the information revolution, the world has become a small village that is directly affected by each other. Thus, it becomes a necessity of preparing learners through education to cope up with the developments of this era. Education, as seen by Khamis (2011) has three basic components which are theory, system, and process. Any view for education except that will be limited. Both Kansara and Attar (2013) have indicated that many systems and forms of technological innovations can be used to develop the educational process.

To make more benefit from the flow rapid information and overcome the low level of students' achievement, the optimal and indispensable solution is the use of technological innovations to help achieve educational goals, attract students' attention towards e-learning, and improve their attitudes towards the subject. As mentioned by "Asettea" (Asettea, p4), both the teacher and learner can deal with the information easily and help understand, remember and apply it in the future.

Both Abdul Hamid, (2001 AD), Al Zubyani, (1429 AH) and "Fazio and Roskos" (2008) emphasized on the role of technological innovations that play a role in making positive attitudes among learners and increase their achievement, through what they provide, and affect their needs. These innovations were considered as the motive that directed their behavior towards the subject.

Assuring that role in the educational process, Al-Halafawi, (2006), and Lionarakis & Parademetriou (2005) have pointed that the technological innovations increase students' participation and learning

Manuscript received January 5, 2023
Manuscript revised January 20, 2023
https://doi.org/10.22937/IJCSNS.2023.23.1.22

flexibility as well as their achievement. Al-Subaiy (1429 AH, 15) has noted that one of the most important helpful technological innovations on students' achievement is the blending of education with modern educational aids, especially computer-assisted technology.

Badawi (2008, 73) has noted that the various forms of academic achievement are one of the goals of education due to its educational importance in the life of the learner. In education, the academic achievement is the most important criterion which determines the student's progress in the school and moving from a grade to another. The achievement increases students' cognitive outcomes and helps them develop their thinking abilities and make decisions, while the student's failure in the achievement leads to feelings of frustration, tension, deficiency and anxiety. The e-learning has affected the educational process in a way that it has become impossible to ignore the students' attitude towards it in the educational process.

There are many studies that dealt with the effectiveness of educational programs based on technological innovations and their effect on achievement, including Al-Jahmi's study (2014), which investigated the effect of using an educational software based on the systemic approach on the development of systemic thinking and academic achievement among students of the Faculty of Industrial Education in Suez. The results of the study have confirmed that there is a positive correlation as a result of the use of an educational software based on systemic approach and academic achievement of scientific concepts in the unit of curriculum system elements among the research sample.

Moreover, Abu Shamala (2013) has confirmed on the effectiveness of a program based on artificial intelligence in developing deductive thinking and academic achievement in the field of information technology among students' eleventh grade in Gaza.

One of the technological innovations is the 3D glasses which have been widely used in the past period in the field of entertainment. Thus, the 3D cinemas have appeared, including interactive themes, that would enable the viewer to feel as if he were a part of the presented event. They also have been used in the field of games, which created a new type of interaction that makes more fun for its users.

Consequently, the use of 3D glasses has become possible in the educational field, as one of technology innovations, which can help develop the level of students' achievement through its appropriate use in the educational process. The type of these innovations is determined in accordance with the educational subject and the students' sample targeted to improve both the level of their achievement and the attitude towards e-learning, which is a major goal of the educational process to cope with the requirements and developments of this era.

Based on what has been previously mentioned, the necessity of using one of the educational innovations was confirmed through an educational program based on using 3D glasses as a technology tool to improve achievement and attitude towards e-learning in science at preparatory stage.

2. Research Problem

As the educational process is the cornerstone of achieving the progress for any society. The student is the most important priority of the whole educational system. The results of Al-Zaydi's study (2012) confirmed that the educational process still suffers from using regular teaching methods, as it depends on the direct interaction between the teacher and the learner, the school curriculum and physical environment of traditional classrooms, which lead to low-quality educational outcomes. Additionally, Al-Osaimi's study (2015) focused on the role of "education technology" in the educational field because of the tremendous scientific progress that occurred in the twentieth century and the beginning of the twenty-first century, and this modern concept eliminates the role of traditional teaching methods and gives the teacher a new responsibility to be the designer and developer of the teaching process for a positive learner.

Young, (2006, p 4–33) pointed that all students don't learn in the same way, thus the traditional way of teaching doesn't suit all learners" One size doesn't fit all". This means the necessity to find new methods and learning styles which stand side by side with the regular learning.

Due to the researchers' confirmation of the existence of the problem, a standardized interview was conducted with many students and teachers of the second-year preparatory school. It included questioning them about the extent of the mastery of the unit items under investigation, their achievement level, and attitudes towards e-learning. The students answered that they had difficulties in linking and remembering the scientific content. The teachers also

emphasized the low levels of students' achievement in scientific subjects in general and science in particular, comparing to the other teaching subjects, especially those lessons related to the nature of the universe and the planets. This signified that this low level in students' achievement should be paid attention to it rapidly.

According to the two researchers' interest in some innovations without the other and at the best knowledge of the two researchers, it wasn't found in the Arab research any study that dealt with converting 2D educational films into 3D through the software package prepared for this or the use of 3D glasses and its relation to the attitude towards e-learning. Despite the great effect of 3D glasses on the students' achievement through what the studies previously referred, and due to principle of availability through technological innovations that are relatively inexpensive, this research has been presented.

The research problem can be tackled in the following main question:

What is the effect of an educational program using 3D glasses as a technological innovation on achievement and attitude towards e-learning? This main question has the following sub-questions:

1. What is the effect of an educational program using 3D glasses as a technological innovation on remembering science subject in the preparatory stage?
2. What is the effect of an educational program using 3D glasses as a technological innovation on comprehending science subject in the preparatory stage?
3. What is the effect of an educational program using 3D glasses as a technological innovation on the application of science subject in the preparatory stage?
4. What is the effect of an educational program using 3D glasses as a technological innovation on the attitude towards e-learning in the science subject in the preparatory stage?
5. There isn't a statistically significant difference at the level of sig. (0.05) among the mean scores of the experimental and control group in the pre-posttest in the achievement levels (remembering, comprehension, application) in science subject among preparatory stage students.
6. There isn't a statistically significant difference at the level of sig. (0.05) among the mean scores of the experimental and control group in the pre-posttest in the level of attitude toward e-learning (motivation, interaction& cooperation, and attitude toward improvement) in science subject among preparatory stage students.

3. Aims of the Research

The aims of research were as follows:

1. Determining the effect of an educational program using 3D glasses as a technological innovation on remembering science subject in the preparatory stage.
2. Exploring the effect of an educational program using 3D glasses as a technological innovation on comprehending science in the preparatory stage.
3. Identifying the effect of an educational program using 3D glasses as a technological innovation on the application of science in the preparatory stage.
4. Determining the effect of an educational program using 3D glasses as a technological innovation on the attitude towards e-learning in science in the preparatory stage
5. Investigating the statistically significant differences at the level of significance (0.05) among the mean scores of the experimental and control groups in the pre /post assessment of the level of academic achievement (remembering, understanding, application) for the second-year preparatory school students in science.
6. Identifying the statistically significant differences at the level of significance (0.05) among the mean scores of the experimental and control groups in the pre /post assessment of the level of attitudes towards e-learning (motivation, interaction and cooperation, attitude toward improvement) among second year preparatory students in science.

4. Significance of the Research

Significance of the research can be summarized as follows:

1. This research is considered as a response to what studies recommend at the present time regarding the necessity of keeping pace with modern educational trends and employing technological innovations that may lead to positive results in the educational process and its fields.

2. Directing the attention of those in charge of the educational process to move away from traditional methods of teaching in science learning.
3. This research can contribute to provide solutions to overcome the difficulties concerning to learning the huge amount of information in the science course.
4. Providing opportunities for curriculum developers to benefit from technological innovations and utilize them in the educational process.

5. Significance of the Research

Research was delimited in the following delimitations:

Objective: The research was delimited to determine the effect of an educational program using 3D glasses as a technological innovation on achievement and the trend towards e-learning.
Human: The research was applied to students of the second grade of the preparatory stage.
Time: The research was applied during the first semester of the academic year 2022/2023.
Spatial: The application of the research is delimited to the Jeddah countryside school.

6. Method of the Research

According to the nature of the current study, the two researchers have applied the following:

- The analytical descriptive approach was used to collect and analyze data and literature in the theoretical framework to describe and diagnose the phenomenon under investigation, shed the light on its various aspects, as well as prepare research materials and tools.
- The quasi-experimental approach was used to compare the students of the experimental and control groups by calculating the mean scores of achievements as well as the attitude towards e-learning in the pre-test to make sure that the two groups were equal. After the experiment, a comparison was made between the experimental and control groups by calculating the mean average of achievement as well as the attitude towards e-learning in the post test, to identify the effect of the independent variable on the dependent variable.

Table (1) The Experimental Design

Group	Pretest	Teaching Methos	Posttest
Exp.	√	3D program	√
Con.	√	Regular	√

7. Variables of Research

The research included the following variables:
-An Independent Variable: A program based on 3D glasses as one of the innovations in educational technology.
-Dependent Variables: Achievement- Attitude Towards E-learning.

8. Sample of the Research

The preparatory schools were counted in the Jeddah Educational Zone. The choice was intentional for the above-mentioned school due to its availability of the possibilities to conduct the experiment in it such as computer labs and well-equipped classrooms. After formally addressing the school principal, the two researchers identified the study sample randomly from the total number of students in the second year of preparatory school. The sample in its final form consisted of (60) female students.

9. Terminology

The research terms were as follows:

3D Glasses

Rio (2007) defined them as glasses consisting of two lenses, one is red and the other is blue. They can be called tricks' lenses as they depend on the fact that each of the eyes is separated by a distance of 5 centimeters. Therefore, each eye sees the image with a relatively different perspective, and the brain exploits this difference to calculate the distance between objects, and by merging the two images, the depth of these objects can be seen, and a triple image can be also formed.
The researchers have defined it procedurally as glasses that depend on the presence of a distance between the two eyes, which leads to the separation of the two images and allows each eye to see only one image. The human mind performs complementary mental operations, so that the two images appear as one image with different dimensions, which gives a sense of depth and the third dimension.

Achievement:

Al- Laqani and Al-Jamal (2006, 84) have defined achievement as: "The extent to which students comprehend what they have done of specific experiences through academic courses. It is measured by the degree that students obtain in achievement tests prepared for this purpose."

It was defined procedurally as: the student's degree obtained in the achievement test prepared for this by the two researchers in a unit for the first semester of the third year of preparatory school students.

Attitude Towards E-Learning:

Mansour (2011, 15) defined it as "the general and relatively stable feeling among learners and the motivation behind their behavior in using, utilizing and focusing learning on technological innovations." Attitude Towards E-Learning was defined procedurally as an increase in the level of motivation, interaction & cooperation, and attitude toward improvement of the learning process using e-learning applications.

10. Theoretical Framework

Educational technology provides modern and effective tools that enable both the teacher and the learner to increase the effectiveness of the educational process and raise the level of academic achievement. Hence, Al-Ruwais (2005:30) indicated that educational technology provided the teacher with many advantages that help him activate the educational process.

Among the most important features is that: (a) it helps expand the teacher's awareness of any innovation in the scientific and educational area, the developments in the society, its renewed requirements and expectations, (b) it gives him the tendency for experiment, innovation and confidence in himself to organize the educational situations, activities and training strategies, (c) In addition to the ability to research and investigate to solve educational problems through knowledge and awareness, as well as evaluative strategies in accordance with these technological developments to evaluate the student's mental, social and sensory growth to ensure its continuity.

Technological Innovation:

Khamis (2003, 246) has defined it as an idea, or a process used from the point of view of the adopter as new alternative to represent innovative solutions for the problems of the existing educational system when utilized in a systematic way to increase the efficiency and effectiveness of the educational process. Al-Najjar (2009) has added that it is an integrated system to raise the level of the educational process and increase its effectiveness and efficiency on scientific bases.

3D Educational Technology Programs:

The applications of educational technology are numerous and developing day by day. One of the educational technologies in the educational process is 3D programs. This technology has transformed 1 D and 2 D drawings into animations that help simulate the reality of things and make them closer to the mind. Thus, the scientific material presented is more interesting for the teacher, the learner and easier for the achievement.

Coob (2007: 211) referred to 3D educational programs as: "Computer-generated technology that allows learners to explore computer-generated 3-D environments that contain representations of real or imaginary objects." It was also defined by Penny, Taylor and Janet (2007: 108-110) as: a 3-D world in which learners' attention can be drawn and controlled in the learning process, based on their personal experiences and experiments. Moreover, Sharpe et al. (2006) confirmed that educational program designs are usually implemented to address the problems arising from the increase in the size of courses and available scientific material, which may negatively affect students' ability to achieve towards e-learning.

Coob (2007), Penny & Taylor & Janet (2007), and Kukulska and Helmy (2012) added that the theory of 3D vision is based on the use of displaying two identical scenes, in which the human mind does deceptive mental operations so that the two images appear as one and with different dimensions. It gives a sense of depth and the third dimension. This is done by the distance between the right and left eye, where each eye sees the scene from a different angle, and therefore there are two identical images, but from two different angles, that enter the human mind. Thus, the viewing process is done using 3D glasses consisting of two-colored lenses (blue, red), and the display can be through using modern projectors. It is necessary to consider the size of the classroom, the number of

students, the distance between the display screen, the students, and the amount of lighting in the classroom, in order to successfully display the 3D program designed for educational purposes successfully.

First: Educational Program Based on Stereoscopic 3D

It is the most familiar and least expensive way to show the third dimension, and its idea depends on presenting a different image of the right eye from the left eye using special glasses to make sure that each eye gets the appropriate image. This can be done by using color-separation, and this style was adopted in this research.

Second: Educational Program Based on Auto-Stereoscopic

Where different pixels appear for each eye, using (lenses or barriers) to direct the appropriate pixels to each eye. This technology does not require special glasses, but its cost is relatively high compared to the previous type.

Third: Volumetric Educational Programs:

They are three-dimensional displays that does not depend on the pixel system and replaces it with voxels of every point in space called voxel. This can be made available through circular mirrors or strong light projection panels, but this type of 3D display is still not available, as its cost is very high that makes its use in the educational process almost non-existent.

The Difference between Virtual 3D Programs and 3D Programs through 3D Glasses

As mentioned by Gurman (2015), the virtual 3D program is the content that was prepared through programs as 3D content, while the 3D program through 3D glasses is the content that was filmed by the camera as two-dimensional film content but is converted to 3D format through programs prepared for that purpose. It can be viewed using 3D glasses designated for those displays.

3D Glasses

The idea behind 3D glasses is based on that each eye looks at the same area at a completely different angle from the other eye, and the brain receives information from each eye and then merges it into one image. The slight difference between the two images is explained as the depth of the body and this generates a three-dimensional image (height, width and depth).

Livingstone (2002) defined it as those glasses that depended on encoding the image of each eye using different filters (usually opposite in color) to the red and blue colors when it is viewed through "three-dimensional glasses" prepared for that. In Figure (1), each image reaches at one eye and collects them together to form an integrated three-dimensional stereo image, as shown in Figure (2).

Figure (1)
3D Glasses

Figure (2)
Converted Image for 3D-vision.

Types of 3D Glasses:

Solomon, (2007), Samsung website (2015), mentioned that there are two types of using 3D glasses technology:

First: Active 3D Glasses:

This type is the best one due to its advantages e.g., providing a three-dimensional experience suitable for the display. This is what the researchers will rely on when applying the program to second year preparatory students in the subject of science during the presentation of the unit under experimentation.

Second: Negative 3D Glasses:

They are less efficient glasses of the first type in which the accuracy of resolution=1080 pixels, halved (540 pixels) between both eyes.

Computerized educational programs are among the most important recent educational technologies that enable educators to find new ways or tools suitable for scientific subjects and characterized by simplicity and low cost. Graham, et al., (2005, p 9-253); Osguthorpe and Graham (2003, p 34-227) have pointed that results of many studies showed that the learning based on technological innovations aims to improve teaching methods, its effectiveness, access and flexibility, and simplify their review. The study of Ercan et al. (2014) dealt with the third-grade primary students' comprehension of astronomical phenomena by using films based on 3D glasses, which emphasized the development of students' skills and their motivation to understand astronomical phenomena in a better way than traditional methods.

Additionally, Norbury and Keith, (2012) investigated the use of programs designed for the display through 3D glasses to explore the components of the human body among secondary stages students. The results confirmed the success of the experiment in achieving a high level of achievement among the students in the experiment. Carrier's study (2012) explored the extent of the persistence of the effect when watching movies displayed through 3D glasses. The results of the study confirmed a positive effect by answering questionnaires prepared for this.

The study of Dan, (2010) emphasized the effect of 3D films on the fourth and fifth grade students and led to a significant development in their comprehension of the subjects better than the regular method. As well as a case study conducted by Slocum (2007), which dealt with stereoscopic presentations using programs based on 3D glasses for some geographical features. The results confirmed the difference in favor of the experimental groups using programs prepared using 3D glasses.

Electronic Learning and Attitude Towards it:

E-learning is one of the modern trends of learning that relies on the applications of technological innovations, through the electronic information network. Abdullah Al-Mousa et al., (2009, 113) defined e-learning as "a method of learning using modern communication mechanisms from a computer and its multiple networks, as well as sound, image, graphics, search engines, electronic libraries and Internet portals, whether in distance learning or in the classroom, which is the use of all types of technology in delivering information in the shortest time and least effort."

Al-Hila (2009, 417) added that direct e-learning (synchronous) is a style of learning based on the Internet to deliver lessons and research topics between the teacher and the learner at the same real time of teaching as well as it has immediate feedback. Due to the indirect (asynchronous) e-learning, the learner receives intensive lessons according to a planned study program and selects the times that suit his circumstances by utilizing e-learning tools such as e-mail and videos and getting the right time and has no feedback.

Attitude Towards E-Learning:

E-learning techniques are the most important modern educational technologies that enable educators to find new teaching aids that fit the nature of scientific subjects. Graham, Allen, and Ure (2005, p 253–9); Osguthorpe and Graham (2003, p 227–34) indicated that several results of studies showed that e-learning aims to improve teaching methods, and increase the effectiveness in terms of cost, access, flexibility, simplification of revision, and development of students' orientation towards this method of learning. Zeitoun (2008,401) defined the attitude as: the responses towards a specific subject from acceptance, rejection, support or opposition. Bassiouni (2007, 127) believes that the attitude helps learner make the decisions and improve his practice of many skills such as cooperation and competition, where the learners' attitude can be changed through learning, guidance, discussion and dialogue. Rajab (2006, 47) indicates that the components of the attitude are the cognitive aspect(awareness), which is what the learner has about the subject of the attitude, and this is available through information and facts related to the subject, and the emotional aspect (passion). It is an emotional tendency of the learner that affects the response to accept or reject the subject of the attitude, and the behavioral (practical) aspect, which is what the learner tends to behave according to specific patterns or a certain situation.

It can be said that the attitude towards e-learning among students stems from their need for an effective educational method in teaching different subjects, which represents the "motivation" towards e-learning. As well as students need an educational method that increases their interaction with the material and cooperation to improve the attitude towards it. The attitude towards e-learning can be measured by knowing the students' level of motivation, interaction, and cooperation towards improvement.

Kukulska and Hulme (2012, 4) noted that the idea of learning using computerized educational programs enables the student to learn effectively, whether simultaneously with the presentation of the scientific subject or later, outside the institutional framework according to the learners' choices. Graham, Allen, and Ure (2005) add that the most common purpose of learning with computerized educational programs is to achieve the best outcomes learning of traditional method such as interaction with the teacher, cooperation in learning, and improving students' achievement. This increases their ability for self-learning outside school, as these features satisfy a large part of students' educational needs.

11. Method:

- Procedures of the Research:

Through reviewing the previous studies and literature related to the variables of the research to follow the appropriate methodological application of administering the tools, the two researchers have done some procedures to achieve the aims of the research. These procedures were:

1. Identifying the instructional unit on which the research will be conducted.
2. Setting up criteria and specifications of the 3D educational program.
3. Selecting and using the 3D educational program.
4. Preparing the tool of the research (achievement test) and verifying its validity and reliability.
5. Preparing the second tool of the research (attitude towards e-learning scale) and verifying its validity and reliability.
6. Making modifications required by the jury members.
7. Selecting the sample randomly and dividing it into two groups.
8. Conducting the experiment through applying the tools of the research.
9. Analyzing the results using SPSS.

First: Identifying the instructional unit on which the research will be conducted:

The educational content concerning the third unit of science subject among second year prep. school students was selected under the title of the Universe and the Solar System. It contains two topics (Universe &Solar System) as they represent the scientific content under investigation. The appropriateness of this unit may be due to:

A- The unit contains scientific knowledge and concepts characterized by the inclusion of the scientific topics that need vision to teach images, models and their supposed movement which made the 3D film very appropriate for teaching scientific content.

B- Due to the abstract terms and concepts in this unit, it is extremely difficult for students of this stage to be aware and comprehend them.

Second: Preparing standards and specifications of the 3D educational program:

The standards and specifications of the proposed 3D educational program used for the current study have been developed, reviewed and approved by educational technology experts and a jury of curricula and methods of teaching science.

Third: Designing the 3D educational program:

The 3D educational program was selected due to the experimental variable of the research, then presented to the experts and jury to suggest modifications to make for reaching the best educational program. This included the following steps:

Fourth: Identifying the physical and human production requirements of the program:

In this step, the two researchers determined the physical and human production requirements, and the following is a presentation of these requirements:

Place:-

The two researchers prepared the place where the final copy of the program will be presented, so that the place should be equipped with the computer and its accessories.

Preparations:-

The two researchers prepared all the necessary appliances for the production process. They ensured their safety, such as ventilation places for the device, the safety of the electricity, and the presence of a current stabilizer as well as choosing the appropriate educational film by looking at the educational films prepared by the Ministry of Education or the film materials available through the network. This treatment deals with the items of the third unit under application to convert it from a traditional two-dimensional film to a three-dimensional one seen through the 3D glasses used for the treatment. 50 three-dimensional glasses were imported from the website www.aliexpress.com by the two researchers to use them in the program.

-Programs:

The two researchers have provided the most recent program necessary for producing 3D program as follows:

1- A program for designing the infographic to make an introduction that shows how the program is used by students.
2- Make Me 3D program to convert 2D films to 3D films.

Figure (3) The Educational Program
Conducting the Initial Treatment for the Program:

The two researchers initially planned the processes of entry, initial installation of the components of the educational source with each other, then making the links between the elements, components and frames, after that the installation of interactive styles, finally conducting the initial treatment of the program, through review and modification, whether by addition or deletion.

Identifying the number of copies of the program:

It was also initially planned for the number of copies that the two researchers need, in terms of the number of juries to the program, and the copies that the researchers will need during the application of the program to the research sample.

Fifth: Preparing the two tools of the research (achievement test & attitude towards e-learning scale) to verify their validity and reliability:

A- Preparing the tools of the research:

The two researchers designed the first tool, which is the achievement test as a statistical tool, in the light of the content and its behavioral objectives. They also developed Abd al-Ati's attitude scale (2006 AD) for measuring the attitude towards e-learning. The scale consisted of (40) phrases, where the scale was developed according to Graham, Allen, and Ure's classification (2005) for the dimensions of "motivation, interaction & cooperation, and attitude towards improvement", where each dimension includes (14) phrases, then the total phrases were (42). The following is a statement of steps for designing the two tools:

1) Identifying the objective of the tools:

The tools were prepared with the aim of pre-assessing the level of achievement in science among the second-year preparatory students (the study sample) and their attitude towards e-learning, as well as for the purpose of post-measurement to apply the experiment of using the three-dimensional educational program in improving the level of achievement and their attitude towards e-learning. The results can be used in validating the statistical questions of the research.

2) Identifyingthe type of two statistical tools:

The two statistical tools were identified according to the methodology used to achieve the general objectives of statistical measurement, then identify the achievement test as the first tool, while attitude towards e-learning was determined to represent the second tool.

3) Designing the content of the two tools:

The content includes:

A- Identifying the behavioral objectives of the scientific content.

The behavioral objectives specially were set-up for the unit under investigation and were approved in accordance with the instructions of the Ministry's letter and the directives of specialists in that field.

B- Identifying the type of items:

After reviewing literature and studies dealt with evaluation methods in general, objective tests, and the standards that should be met in achievement tests and the scale of attitude towards e-learning, the test questions were formulated in the style of choosing the best answer from multiple alternatives" Multiple Choice". This style is considered as one of the best types and commonly used in objective tests, while the scale choices were built according to the five-Point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree).

C- Rephrasing the items:

In rephrasing the items of the two tools, the following points were considered:

- When formulating each question, it considers measuring one of the levels in the achievement test e.g. (Remember, Comprehension, Application), and it takes in to account the attitude towards e-learning Scale points (motivation, interaction & cooperation, and attitude for improvement).
- The phrases of the two tools are clear and do not bear more than one meaning, and that they contain sufficient information, skills and data that contribute to its solution.
- The order of right answers in the test and phrases in the scale were arranged randomly.

D- Phrasing the instructions of the tools:
The instructions for each tool (the test and scale) were placed on the first page. It considers that they were clear, accurate and simple so that the students' results can't be affected or changed. Moreover, they are clear in terms of how to determine the answer in the correct place, as well as the chosen phrase.
E- Grading scores and calculating clarity:
When correcting the test, it was considered that one point is given for each correct answer and nothing for each wrong one. As for the scale, the degree of response was determined according to the statistical Likert scale standard. The clarity of the instructions of the two tools was calculated according to the clarity of the instructions, as there was no ambiguity or confusion in items.
F- Measuring the coefficient of easiness and difficulty:
The easiness and difficulty coefficients for the items of the two tools were calculated using a certain equation. It was found that the best question in the test and the best phrase in the scale have an average rate of easiness reaching to (50%), but the questions and phrases should range in easiness from (10% to 90%). Because this gradation contributes to identify the best students and improve the performance of the weakest students.

Hence, the two researchers considered that the item in which the coefficient of difficulty reaches more than (90%) is a very easy item, and that the item in which the coefficient of difficulty reaches less than (10%) is a difficult one and should be deleted from the test items as well as the scale.

B- Ensure the validity and reliability of the research tools:

1- The validity of the two tools:
A- The two tools were presented in their initial form to a jury from the faculty members. A letter was sent to the jury explaining the problem and objectives of the research, in order to ascertain the extent to which each of the test questions is related to the dimension to which it belongs, as well as to ensure that each phrase of the scale was consistent with which it belongs, the extent of clarity, the correctness of the language and its appropriateness to achieve the goal for which it was developed. This help suggest ways to improve the content by deleting, adding, reformulating, or other than what they see fit.
B – Conducting the necessary modifications suggested by the jury, after restoring the hard copies of the study tools from them, as the researchers made the modifications agreed upon by more than (80%) of the jury, whether by rephrasing the words, deleting or adding some questions and phrases, until reaching the final form of the two tools.

2- Measuring the reliability of two tools:

To calculate the reliability of the two tools, the split-half equation of Sperman and Brown was applied to find the correlation coefficient between the components of each tool separately according to the research variables. Table No. (2) shows the split-half reliability coefficient of the achievement test and the attitude scale.

Table (2)
The split-half reliability coefficient of the study tools and its dimensions

N.	Tools	Reliability Coefficient
1	Achievement Test	0.910
2	A scale of Attitude towards E-Learning	0.922

The above table showed that the reliability of the two tools was high, as the overall reliability coefficient of the achievement test reached (0.910) and the scale of attitude towards e-learning (0.922), which were high levels in the reliability coefficients. This signified that the two tools were appropriate for the research purposes, as well as the reliability of using the two tools in measuring what was prepared and the dimensions, questions, phrases and their suitability for field application were reliable.

Sixth: Selecting the study sample and dividing it randomly into two groups:

The sample was selected from the second-year preparatory school students and divided into: (30) male and female students as an experimental group, (30) male and female students as a control group, as shown in Table (3).

Table (3)
The Numbers of the study sample students distributed on two groups

Group	N. of Students
Experimental	30
Control	30
Total	60

Seventh: Conducting the stepsof the experiment through applying the two tools of the research

- Pre-application of the two tools on the two groups the control and experiemental groups.
- Application of the treatment on the two groups.
- Post-application of the two tools on the two groups the control and experiemental groups.

- Pre-application of the two study tools on the two groups: the control and experiemental groups

The pre-application of the two study tools was conducted on the control and experimental groups before starting the experiment. This aims to measure what the second-year preparatory students (study sample) had of previous information about the information included in the subject under investigation as well as their attitude. The test took a period of (40) minutes as it is scheduled, while the questionnaire was distributed on the following day, and it took 40 minutes to record the responses.

-Application of the two experiemental treatment on the two groups of the study

The two researchers followed the following steps:

- Providing the necessary appliances for the experiment: The school was intentionally selected as it had an integrated computer lab, which contained computers and a display screen for students from the teacher's computer.
- Choose and use the 3D educational program: The 3D educational program, whose content was designed for the chosen unit, was selected and used to become the approved program in the study. It was designed based on the principle of interactive learning.
- Equipping the place of teaching the experimental group: The place designated for teaching the experimental group was prepared, by making sure of the adequacy of the devices in terms of number and readiness, as well as making sure that they were available in the same period of the lessons prepared for teaching the unit under investigation in the classroom by the traditional way.
- The experimental group was trained on how to: deal with the 3D educational program, use its glasses and its components before starting the experiment.
- Teaching began for the experimental group according to the time plan prepared by the two researchers. In a parallel line, the teaching of the same unit began for the control group.

for the two tools of the study on application Post-the two groups-

The post-application of the two study tools was administered to the experimental and control groups immediately after the completion of the experiment. The test took a period of (40) minutes as scheduled, while the scale of attitude was distributed on the following day, and it also took (40) minutes to write down the responses.

Eighth: Analyzing the Results Using the Appropriate Statistical Styles:

The two researchers adopted the following statistical analysis styles:

- Themean scores of each group: to signify on the values of each group from the study groups with only one value to represent it.
- Standard deviation of each group's scores: to identify the deviation of each score from its mean.
- T-test: to clarify the differences between the performance of the control group and the experimental group.

The Statistical Packages for Social Sciences (SPSS) was used to analyze the data obtained.

Discussing results and interpreting them:

The main statistical question of the research was represented in the following question:

There were no statistically significant differences at the level of significance (0.05) among the mean scores of the experimental and control group in the pre and post measurement of the level of academic achievement in the dimensions of (remembering, comprehension, application) among the second-year preparatory school students in science.

First: Presenting the results:

After the application of the experiment, and conducting the post-achievement test, the results were analyzed to verify the validity of the study questions. The results were as follows:

To answer the first statistical question:

To answer the statistical question, the mean scores, standard deviation, and t-value between the experimental and control groups were calculated by comparing the results of the pre-test and post-test for the level of achievement in science, and identifying the differences between both tests, as follows:

First: Results of the pre-test:

The mean scores, standard deviation and T-value between the experimental and control groups were calculated for the results of the pre-test to determine the level of achievement in science among the sample members, and the results were as shown in Table (4).

Table (4)T -value and the significant differences between the experimental and control groups in the Pre-assessment

Level of Achievement	Group	N.	Mean	S .D	T-value	Sig.
Remembering	Exp.	30	1.492	0.859	1.612	Not Sig
	Cont.	30	1.490	0.789		
Comprehension	Exp.	30	1.254	0.786	1.594	Not Sig
	Cont.	30	1.240	0.859		
Application	Exp.	30	0.00	0.00	00 .0	Not Sig
	Cont.	30	0.00	0.00		
Achievement	Exp.	30	3.223	0.899	1.662	Not Sig
	Cont.	30	3.232	0.912		

Table (4) showed that there were no statistically significant differences at the significance level (0.05) for any level of achievement: "remembering, comprehension, application and achievement". This signified that there were no differences in the mean scores of achievements in science subject in pre-measurement between the experimental and control group. This indicates the homogeneity of the experimental and control groups and their similarity before conducting the experiment.

There were no statistically significant differences at the level of significance (0.05) between the mean scores of the second-year preparatory students of the experimental and control group on the pre-achievement test in science.

Second: Results of the post-test

The mean scores, standard deviation and T- value for the results of the post-test between the experimental and control groups were calculated to determine the level of achievement in the third unit in science for the sample, and the results were shown in Table (5):

Table (5) T-value and its statistical significance level between the two groups experiemental and control in the post-assessment

Level of Achievement	Group	N.	Mean	S.D	T-value	Sig.
Remembering	Exp	30	4.312	0.798	4.421	Sig
	Cont	30	2.811	0.886		
Comprehension	Exp	30	4.266	0.915	4.491	Sig
	Cont	30	2.910	0.766		
Application	Exp	30	4.335	0.788	4.589	Sig
	Cont	30	2.852	0.933		
Achievement	Exp	30	4.232	0.869	4.611	Sig
	Cont	30	2.934	0.853		

Table (5) indicated that the T-value was statistically significant at the first level of achievement "Remembering" in the third unit of science. This means that there were statistically significant differences at the level of significance (0.05) among the mean scores of the second-year preparatory students for the experimental and control groups on the achievement test in the third unit of science at the first level of achievement "remembering", in favor of the experimental group.

It is also clear that the T-value was statistically significant at the second level of achievement "Comprehension", in the third unit in science. This means that there were statistically significant differences at the level of significance (0.05) among the mean scores of the experimental and control group of second-year preparatory students on the achievement test in the third unit of science at the second level of achievement, which is the level of "Comprehension" in favor of the experimental group.

It was shown that the T-value was statistically significant at the third level of achievement “Application", in the third unit in science. This meant that there were statistically significant differences at the level of significance (0.05) among the mean scores of the second-year preparatory students of the experimental and control group on the achievement test in the third unit of science at the third level of achievement, which is the level of "application", in favor of the experimental group. Finally, it was indicated that the T-value was statistically significant at all levels of achievement. Thus, there were statistically significant differences in the mean scores of achievements in the third unit of science in the post-assessment in favor of the experimental group.The mean scores, standard deviation and T-value were calculated among the results of achievement pre-posttest of the experimental group in the level of achievement in the third unit of science. The results were shown in Table (6):

Table (6) T-Value and the its statistical significance level for the differences between the pre-post-tes of the experimental group

Level of Achievement	Group	N.	Mean	S .D	T-value	Sig
Rememering	Exp	30	3.223	0.899	4.653	Sig.
	Cont	30	4.312	0.912		
Comprehension	Exp	30	1.254	0.786	4.569	.Sig
	Cont	30	4.335	0.859		
Application	Exp	30	0.00	0.859	4.612	.Sig
	Cont	30	4.266	0.789		
Achievement	Exp	30	1.492	0.859	4.598	Sig.
	Cont	30	4.232	0.789		

Table (6) showed that the value of (T) was statistically significant at the first level of achievement, which is the level of "Remembering". This indicated that there were statistically significant differences in the mean scores of achievement test in the third unit of science at the level of remembering of the experimental group in favor of the post-assessment.

It can also be shown that the T-value was statistically significant at the second level of achievement, which is the level of "Comprehension". This signified that there were statistically significant differences in the mean scores of achievement test in the third unit of science at the level of comprehension of the experimental group in favor of the post-assessment.

It can be further indicated that the T-value was statistically significant at the third level of achievement, which is the level of "Application". This signified that there were statistically significant differences in the mean scores of achievement test in the third unit of science at the level of Application of the experimental group in favor of the post-assessment.

Finally, it was clear that the T-value was statistically significant in the achievement in the third unit of science. This meant that there were statistically significant differences in the mean scores of achievements of the experimental group in favor of the post-assessment.

Thus, the answer to the statistical question: (There was a statistically significant difference at the level of significance (0.05) among the mean scores of the second- year preparatory students of the experimental and control group on the achievement test for the third unit in science).

To answer the second statistical question:

There wasn't a statistically significant difference at the level of significance (0.05) among the mean scores of the experimental and control group on the level of attitude towards e-learning in these dimensions (motivation, interaction, cooperation and attitude towards improvement) among the second- year preparatory students.

To answer the second statistical question, the mean scores, SD., T-value for the pre-post scale of attitude towards e-learning between the experimental and control group students' responses were calculated then the differences were identified among pre-post responses as follows:

First: Results of the pre-assessment:

The mean scores, SD., T- value for the pre-post scale of attitude towards e-learning between the experimental and control group students' responses were calculated. The results were indicated in table (7).

Table (7) T- value and its statistical significance for the differences among the experimental and control groups in the pre-assessment.

Attitude Level Towards Improvement	Group	N.	Mean	SD	T-value	Sig.
Motivation	Exp	30	2.220	0.853	1.334	not sig
	Cont	30	2.186	0.844		
Interaction& Cooperation	Exp	30	2.333	0.820	1.222	not sig
	Cont	30	2.356	0.730		
Attitude towards Improvement	Exp	30	2.414	0.954	1.461	not sig
	Cont	30	2.216	0.922		
Total Sum	Exp	30	1.912	0.785	1.318	not sig
	Cont	30	1.986	0.881		

Table(7).showed that there wasn't statistically significant difference at the level of (0.05)for any level of attitude towards e-learning in "motivation interaction&cooperation and attitude towards "improvement.Thus, there wasn't any significantly difference for the experiemntal and control students' reponses on the pre assessement on the scale attitude towards e-learning.. This signified that there wasn't a statistically significant difference at the levet of sig. among the responses of the expriemental and (0.05) control group on the pre assessement on the scaleof attitude towards e-learning.

Second: the post-assessment:

The mean scores, SD., T- value on the scale of attitude towards e-learning between the experimental and control group students' responses were calculated. The results were indicated in table (8)

Table (8) T-value and its statistical significance for the differences between the experimental and control groups in the post-assessment

Dimension	Group	N.	Mean	SD.	T-value	Sig.
Motivation	Exp	30	5.209	1.135	4.220	Sig.
	Cont	30	1.980	2.820		
Interaction& Cooperation	Exp	30	4.123	1.136	4.675	Sig.
	Cont	30	2.310	1.422		
Attitude towards Improvement	Exp	30	4.118	0.412	4.512	Sig.
	Cont	30	2.211	0.568		
Total Sum	Exp	30	4.483	0.894	4.135	Sig.
	Cont	30	2.167	1.603		

T- value at the level of sig (0.05), df (60(=)2.00(

Table(8) showed that there was statistically significant difference at the level of (0.05) among the

mean scores of the experiemental and control groups of prep.school students in the attitude towards e-learning concwas ng the dimension) of motivation as measured t-value was)4.220(and it was higher than T-value in the table at the df=(2).

Table(8) also indicated that there was statistically significant difference at the level of (0.05) among the mean scores of the experiemental and control groups of preparatory school students in the attitude towards e-learning concerning the dimension of " Interaction& Cooperation" as measured T-value table was)4.675(and it was higher than T-value in the)at the df=)2

Table(8) also showedthat there was statistically significant difference at the level of)0.05(among the mean scores of the experiemental and control groups of preparatory school students in the attitude towards e-learning concerning the dimension of " Attitude towards Improvement" as measured T-value was table at and it was higher than T-value in the (4.512) the df=(2)

Finally, there was statistically significant difference at the level of)0.05(among the mean scores of the experiemental and control groups of preparatory school students in the attitude towards e-learning where as the total sumof measured T-value table was)4.135(and it was higher than T-value in the at the df=(2).

Third: Differences between the pre-post assessment:

The mean scores, SD., T- value on the scale of attitude towards e-learning between the experimental and control group students' responses were calculated. The results were indicated in Table (9)

Table (9)

T- value and its statistical significance for the differences among the experimental and control groups in the pre- post assessment

Dimension	Group	N.	Mean	SD.	T-value	Sig.
Motivation	Exp	30	2.414	0.785	4.364	Sig.
	Cont	30	5.209	1.135		
Interaction& Cooperation	Exp	30	2.333	0.820	4.578	Sig.
	Cont	30	4.123	1.136		
Attitude towards Improvement	Exp	30	1.912	0.954	4.486	Sig.
	Cont	30	4.118	0.412		
	Cont	30	2.414	0.785		

Table (9) showed that T –value wasstatistically significant at the first level of attitude towards e-learning concerning the dimension of " Motivation as there was a statistically significant difference at the mean scores of responses that refers to modiviation towards e-learning among the experimental group in favor of the post-assessment.

It can be – showed that Tvalue wasstatistically significant at the second level of attitude towards e-learning concerning the dimension of "interaction&Cooperationas therewas a statistically significant difference at the mean scores of responses that refers to interaction&Cooperation towards e-learning among the experimental group in favor of the post-assessment.

T –value also was statisticallysignificant at the third level of attitude towards e-learning concerning "the dimension of " attitude towards improvement as therewas a statistically significant difference at the mean scores of responses that refers to"attitude towards Improvement"among the experimental group in favor of the post- assessment.

Finally, it was indicated that T-value was generally significant towards e-learning. Hence, there was a statistically significant difference in the mean scores of the experimental group students' responses/ attitudes toward e-learning among the experimental group in favor the post-assessment.

Thus, the answer to thestatistical questionis: Therewas a satistically significant difference at the level of sig.)0.05(among the mean scores of the experiemental and control group in the pre-post asessment for the level of attitude towards e-learning in the dimensions (motivation, interaction & cooperation and attitude towards Improvement) among the second year prep school students .

Second: Discussion of the results:

The research concluded to the following results:

- There was a satistically sigificant difference at the level of sig.)0.05(among the mean scores of the school experiemtal and control second year prep-group students in the post assessment in the level of achievement in the third unit in the science subject as the differences were in favor of the experiemental group.
- There was a satistically sigificant difference at the level of sig.)0.05(among the mean scores of the second year prep- school experiemtal and control group students in the post assessment in the level of attitude towards e-learning in the third unit in the science subject as the differences were in favor of the experiemental group.

By analyzing these results, it was found that the positive effect of the 3D educational program for improving the level of achievement for the third unit in science and the attitude towards e-learning for the second-year preparatory students.

The two researchers attribute this effect resulting to the use of the 3D educational program for improving the level of achievement of the third unit in science for the second-year preparatory students as follows:

1. The 3D educational program allowed the experimental group students to practice self-learning and achievement according to the individual differences among them, and this means achieving the interaction between the three-dimensional educational program and the students. This in turn leads to faster and better learning.
2. The three-dimensional educational program provided the opportunity to achieve academically towards the goals due to the freedom from time constraints, as in the traditional method.
3. The program provided the opportunity for coexistence through simulation, which allowed the embodiment of scientific information and made it more specific and clearer.
4. The program allowed the teacher to practice new roles such as guidance, counseling, organizing and facilitating the learning process, which may contribute to set-up a safe environment for students during their treatments with the program.
5. The program provided students with a sense of fun and excitement, and a good interest in learning, which was positively reflected in the high level of achievement for the third unit in science.
6. The program developed the students' mental abilities by providing more than one element such as audio texts (Spoken Words or Texts), still pictures, animations (Motion Picture`s) and sound effects (Music or Sound), which was reflected to increase their academic achievement, especially the levels of comprehension and application.
7. The program enhanced motivation, interaction, cooperation, and the attitude of improvement towards e-learning among students of the second year of prep-school. This means that it enhances all dimensions of the attitudes towards e-learning.

Recommendations:

In the light of the findings of the current research, the two researchers presented the following recommendations:

1. W orking on the application of using the technological innovations in all different education stages.
2. Training teachers sufficiently on using the technological innovations.
3. The necessity of considering 'the students educational needs and making benefit from them when selecting the approriate technological innovations to satisfy these needs
4. Developing the regular teaching methods using the technologial innovations according to the depth of the students' needs in each secientific subject.
5. The balance in the implementation of scientific concepts and information in educational programs to limitfrom the students' knowledge distortion.
6. Applying an extensive study on the different educational curricula and identifying the technological innovations which can be utilized to modify each syllabus and increase the effectiveness of learning.

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