أثر تطبيق تقنية الهولوجرام عبر الهاتف المحمول في تنمية مهارات إنتاج الصور المجسمة والتخيل البصري لدى طلبة الدراسات العليا

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المُسْتَخْلَص: دفعت الدراسة إلى الكشف عن فاعلية تقنية الهولوجرام عبر الهاتف المحمول في تنمية مهارات تصميم وإنتاج الصور المجسمة والتخيل البصري لدى طلبة الدراسات العليا في كلية التربية جامعة الباحة. استخدمت الدراسة المنهج شبه التجريبي واشتملت أدوات الدراسة على اختبار تحصيلي واختبار التخيل البصري وبطلاقة ملاحظة لقياس جوانب مهارات الأداء لإنتاج الصور المجسمة، من خلال تطبيق الهولوجرام. وتكونت عينة الدراسة من ٣٠ طالب دراسات عليا. استخدم الباحث اختبار T لقياس الفروق بين مجموعة تجريبية (باستخدام تقنية الهولوجرام) ومجموعة ضابطة (بالطريقة المعتادة). أظهرت النتائج وجود فروق ذات دلالة إحصائية عند مستوى دلالة ٠,٠٥ في التحصيل المعرفي والتخيل البصري في الاختبار البعدي لصالح المجموعة التجريبية التي درست بتقنية الهولوجرام. كما ظهر فرق جوهري عند مستوى ٠,٠٥ في قائمة بطاقة الملاحظة في الاختبار البعدي لصالح المجموعة التجريبية في بعض مهارات إنتاج الصور المجسمة.

الكلمات المفتاحية: تقنية الهولوجرام؛ الصور المجسمة؛ الخيال البصري.

The Effect of Applying Hologram Technology via Mobile Phone on Developing Skills of Producing Stereoscopic Images and Visual Imagination Skills among Postgraduate students

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Abstract: The study aimed to reveal the effect of hologram technology via mobile phone in developing skills of producing stereoscopic images and visual imagination among postgraduate students at the College of Education, Al-Baha University. The study has used a quasi-experimental approach to prepare the literature framework and a measurement tool including an achievement test, a visual imagination test and an observation checklist to measure the aspects of performance skills for producing stereoscopic images, through the application of hologram. The study sample consisted of 30 postgraduate students. The researcher used a T test to measure the differences between an experimental group (using hologram technique) and a control group (using the usual method). The results showed that there were significant differences at the level of significance (0.05) on the cognitive achievement and visual imagination in the post-test in favor of the experimental group, that studied with the hologram technique. There was also a significant difference at level of 0.05 on the observation checklist in the post-test in favor of the experimental group in some stereoscopic images producing skills. This confirms the effectiveness of the hologram technology in developing skills of producing stereoscopic and visual imagination for students at the university .

Key Words: Hologram technique; Stereoscopic images; Visual imagination.

INTRODUCTION

The hologram is seen near its surface or viewed with laser light. In teaching with hologram technology, students will enjoy the holographic lecture and gain knowledge, skills and visual imagination compared to traditional learning. Indeed, hologram technology can support and enhance the development of stereoscopic image production skills and visual imagination among graduate students. The primary feature is teacher-generated content, the creation of which allows sharing of knowledge that reflects the collective intelligence of the respective users and supports a constructive learning environment. Therefore, the reasons for using hologram technology are to make the learning process based on the capabilities of the students, to achieve the goals of developing the student's skills and to facilitate visual imagination, which is expensive or impossible to implement in the classroom. And also, to reduce the time spent teaching it, the need for repetition, and to ensure accurate results with practice.

Barkhaya and Abdhalim (2016) showed that three-dimensional hologram is an effective educational tool in grapping students' attention and enhancing their understanding. This was because 3DH technology can decompose a complex subject into an easy form which develops students' understanding.

The characteristics of 3D simulation programs are as follows (Shelly, Gunter, & Gunter, 2012) : Raising students' interest, encouraging research and role-play among students, providing the elements of excitement that work to attract and maintain attention, allowing the continuation of education or training in separate sessions, helping to achieve the goals in a reasonable time, simulating reality. Scientist Dennis Gabor invented this Technology in 1947. The word, hologram Consists of Greek terms, "holos" for "full width", meaning of grams "written". Hologram is technology. It scatters light from an object and displays it in its 3D object. A holographic image can be seen with 3D glasses or by see luminous 3D printing. Holograms can be viewed on a sheet of plastic or glass or using LED Lights.

According to Li, Yu, Wu, and Wei (2022) there are two patterns of holograms: Reflection hologram and Transmission hologram. In a reflection hologram, a hologram is seen near its surface and is the most common type seen in galleries. The hologram of a typical transmission is projected using laser light, usually of the same type used in the recording. In transmission, hologram light is directed from behind the hologram and the image is transmitted to the side of the observer. The hologram technology is an aid in improving students' ability to produce stereoscopic images and visual imagination due to facilitating the learning process by providing mental images and enhancing meaning in better ways to learn for the skill. Visual Imagination is a mental process and an important intellectual activity that has attracted the attention of many psychologists, especially cognitive scientists such as Piaget, Ozabel and others who have shown great interest in studying its components and application procedures. Hologram technology provides a way to develop the ability to think and visual imagination. Visual imagination is based on logical roles associated with the educational situation. Therefore, visual imagination requires the learner to find intangible symbolic relationships for the situation experiencing, and to relate those symbols to achieve specific goals.

Many instructors in the world have recently been interested in developing Educational strategies at universities, through the development of the students' performance in dealing with holographic images in learning. Holograms can educate individuals how to discover stories in the data, and how to visually communicate and share them with the audience

for effectiveness. The stereoscopic images are defined as the common pattern which can appear the data in an image pattern (Lankow et al., 2012).

Hologram technology has affected students on the development of some skills of producing stereoscopic images, and visual imagination. Because visualizations are more important than verbal or text. Hologram technology provides the ability to see the hologram from all sides. It may contain more than one image in the same painting. The researcher seeks to improve students' skills and visual imagination by using hologram facilitate in classroom on image processing unit. The importance of holograms is to present image and word together including suitable colors, and forms. Therefore, learners can deal with visual data successfully. Motivation theory can be supportive for hologram use in educational process because of students' motivation to learn and pay attention. Visual imagination provides moving away from verbal objects, transferring the verbal to the image, seeing issues from different angles, and making learning more interesting.

Korulkar and Lobo (2017) discussed improving the learning process and teaching strategies and achieving a positive outcome in the educational process. The experimental result reveals that; 30.76% better learning occurs better than other paradigms. The student feels more interested in learning through hologram technology. The primary motive for applying this concept is to involve this new learning technology in the education system. Gohane and Longadge (2014) show how 3D hologram projection technology works and how it is beneficial to everyone and displays what is important and what is needed of hologram technology.

Ibrahim (2018) stated that educational systems focus on integrating experiences and educational situations with the skills and processes that make the learner active, translatable, and discover and use knowledge. In this study, the researcher concluded the importance of conducting a study aimed at one of the technologies. It is the hologram technique in teaching multimedia subject, and image processing unit to develop skills of hologram production and visual imagination to overcome the difficulties faced by students and instructors in order to achieve educational goals.

PROBLEMS OF THE STUDY

The researcher monitored the teaching performance of graduate students, as it appeared that students could not imagine intangible things unless they were directly related to the mental ability in the visual aspects, mutual and consistency. The learner must also interact with and imagine these sensations so that the mental ability appears in producing homograph images, rather than memorizing devoid of reasonable objects. All this can only be done by applying hologram technology which develops some stereoscopic images production skills and visual imagination among these students. The researcher noticed the low level of students in these skills and visual imagination, in particular, and the difficulty of students imagining these three-dimensional shapes based on test results in the interim in image processing unit. Hologram technology was not used as a new method in the educational environment at Albaha university to develop students' skills and visual imagination.

Malik, Sun and Nisar (2012) indicated that: 3D graphics have become one of the most important fields have specificity, and pixels in 3D computer graphics need to add a depth property that indicates the location of a point on the imaginary (Z) axis. Visual aids facilitate learning by providing mental images and embedding meaning in better ways to learn the skill.

Although various studies have discussed the effect of using hologram technology, few studies have been conducted at Saudi Arabia universities. Investigating the way to improve students' skills and visual imagination at the College of Education at Al-Baha University could therefore fill a gap in the literature. The researcher conducted a pilot study to determine the problem of the study through a test to measure the 20 students' knowledge on image processing by hologram technology. It was found that the low of skills and visual imagination between 30-50% of the total number of studies, which prompted the researcher to use a modern technology (hologram application) to develop the image producing skills and visual imagination.

The researcher detected a low achievement level of students in terms of the development of image producing skills and visual imagination in education because of the difficulty of a traditional teaching method. Therefore, it needs to use recent technology to improve learners' image producing skills and visual imagination by using hologram application. In this study, the researcher seeks to detect the impact of hologram technique on students' skills and visual imagination in terms of image processing in the selected subject at the college of education at Al-Baha University. hologram will increase learners' skills of producing holographic images. Therefore, the study centered on the lack of students' skills of image producing when taught by traditional method. Thus, holograms are needed as a new technology necessary to implement the course material.

The present study is the first study aimed at revealing the effectiveness of the enhanced hologram technology on students' skills of producing stereoscopic images and visual imagination in the College of education at Al-Baha University. The researcher found the focus of the educational strategy at time on the technology of enhanced hologram because it is an effective method to increase skills of producing stereoscopic images and visual imagination.

The literature advocates various degrees of stereoscopic images and discusses their impact on the learning environment. Faculty members need to employ hologram technology to improve learners' skills producing stereoscopic images and visual imagination. The purpose of this study was to explore the impact of hologram technology on students' skills of producing stereoscopic images and visual imagination at the College of Education at Al-Baha University.

Research Question

The study aimed to examine the following research question:

1- How effective is hologram technology via mobile phone in developing skills on producing stereoscopic images among postgraduate students?
2- How effective is hologram technology via mobile phone in developing visual imagination among postgraduate students?

THE ASSUMPTIONS OF THE STUDY

1- There is a statically significant difference on the level of (0.05) between the mean scores of the experimental group- using a hologram technology and the control group using a usual method on the achievement post-test due to the program.
2- There is a statically significant difference on the level of (0.05) between the mean scores of the experimental group- using a hologram technology and the control group using a usual method on observation checklist post-test due to the program.

3- There is a statically significant difference on the level of (0.05) between the mean scores of the experimental group- using a hologram technology and the control group using a usual method on visual imagination post-test due to the program.

STUDY OBJECTIVES

In summary, the researcher aimed:

1. Measure the effect of applying hologram technology via mobile phones on developing stereoscopic image production skills among postgraduate students at Al- Baha University.
2. Measure the effect of applying hologram technology via mobile phones on developing visual imagination among postgraduate students at Al- Baha University.
3. Develop a learning environment using hologram technology to enhance the skills of producing stereoscopic images and visual imagination among postgraduate students.

THE IMPORTANCE OF THE STUDY

1- Help educators in choosing the most appropriate hologram application for their subjects.
2- Be a starting point for further research that can be applied to several lessons across a range of higher education institutes.
3- Encouraging university professors to use hologram technology in education despite its high cost.

LIMITATIONS

The study was conducted on master students who registered for the second semester of 2021-2022 on the course title " Multimedia " at the college of education at Al-Baha University. The researcher selected the " image processing " unit to evaluate students' skills of stereoscopic image production, and visual imagination because the unit contained lot of data in the form of text. The study aimed to detect the effect of hologram technology on developing students' skills of producing stereoscopic images and visual imagination

THE DEFINITION OF TERMS

HOLOGRAM TECHNOLOGY

The technology was invented by scientist Dennis Gabor in 1947. The word hologram is made up of the Greek terms, “holos” for “full view” and gram meaning “written.” So hologram is the method of scattering light from an object and presenting it in a three dimensional object.

Barkhaya and Abdhalim (2016) defined hologram technology is a method of visualization that has been increasingly used in the marketing, entertainment and education.

Operationally, hologram technology is a photographic technique that records the light emitted by an object and then presents it in three dimensions. Holograms have appeared in various forms over the years including transmission holograms.

PRODUCING STEREOSCOPIC IMAGES SKILLS

The actual performance performed by the student during work with a degree of accuracy, speed, proficiency, and accuracy in performance to the degree that the student obtains in the observation checklist (Al-Saeed and Mahmoud, 2015).

Stereoscopic images can be seen with 3D glasses, by seeing lit 3D prints, projected on a plastic sheet or glass, or with LED lights. Students 'skills depend on speed and clarity based on knowledge and application in designing stereoscopic images using hologram technology correctly and without errors, while saving time, effort and costs through the grades obtained by the student.

VISUAL IMAGINATION

Potter (2008) stated that imagination is a visual thinking through which the individual reaches the ideas and new meanings inside him. The brain and imagination work in one framework, and that imagination is not necessarily intangible imaginary images, it is ability of the learner responsible about creating new things in the form of ideas, solutions, proposals, and meanings, and linking them to the learner's previous experiences in various forms.

The researcher defines it procedurally: that visual imagination is a process related to an individual's experiences that shows his ability to see shapes and images from different angles and multiple visions and is translated into his ability to extract data and information by reading visual shapes and images and converting them into written or spoken language.

Awad (2017) defined holograms or particle imaging, it is a unique technology with a feature that gives it the ability to recreate an image of objects in a 3D image in space by relying on lasers. Image is a presentation of information in a graphic format designed to make data simple and understandable at a glance (Tufte, 2001). Visualization is defined as an impact display used by individuals to comprehend complex data (Keller &Tergan, 2005).

In short, using images is a way of transferring theoretical or written data into visual information, which can be used to organize the lesson content to ensure that the information is attractive, and learners understand it easily. Infographics can also be defined as a method to change complex data into information that can be understood easily and quickly by learners.

LITERATURE REVIEW

Elmarash, Adrah, and Eljadi (2021) studied the importance of using hologram technology in the learning environment for higher institutes in Libya. The advantage of using hologram technology that allows students to interact with a real 3D image of object, helps students to better understand the contents of the lesson due to the fact that its movement in three dimensions attracts more attention. Hologram technology can be used to increase interaction in distance learning programs to enhance students' professional skills and achieve the maximum benefits for them. Three-dimensional hologram technology has positive potential and is able to attract students' attention in learning as well as reduce their perception load. Hologram technology is an effective tool in classroom, to develop abstract imagination of objects or concepts; it can help students to improve their awareness in order to understand the concept of learning subjects, especially in medical and engineering sector as they get to have a better understanding of what they are learning. Hologram technology can be applied at every educational level

(preschool, elementary, secondary school, and higher education). This can overcome the problem of slow technology adaptation in the education system.

The aim of a study carried out by Al Fawzan and Al-Shammari (2021) was to examine the impact of using hologram technique in computer teaching on conceptual comprehension and development of logical thinking for high school students in the city of Ha'il in Saudi Arabia. The study sample was comprised of 40 students at a high school, who divided into two groups (quasi-experimental design): an experimental group of 20 students were taught using a hologram technology, and the control group of 20 students were taught using a traditional method. The measuring tool was an achievement test of conceptual comprehension and logical thinking among second-grade secondary school students. The results showed that there was a statistically significant difference between the means scores of the control and experimental group, and a statistically significant difference between the means scores in related to the experimental approach in conceptual comprehension and logical thinking. Thus, showing that teaching using hologram technology improved individuals' analytical conceptual comprehension and logical thinking. when studying the computer architecture unit. In short, holograms can simplify conceptual comprehension and logical thinking and hold learners' attention, thus making it easier for learners to cope with complex data.

According to Al-Khatatba and Al-Omari (2021) their study focused on the reflective thinking of high school learners by designing an Educational Unit Using Hologram Technology located in the Bani Ubaid Brigade in Jordan. Two groups of students were chosen. The study sample was made up of 60 learners that were divided into two groups: an experimental group, which was taught using hologram technology, and the control group, which was taught by traditional methods. The semi-experimental approach was used to design an educational teaching unit and measure its impact on the development of reflective thinking among basic stage students in Jordan. The measuring tool was an achievement test. The results showed that there was statistically significant difference between the means scores of the control and experimental groups, and a statistically significant difference between the means scores of the experimental group in favor of the group that was taught using 3D stereoscopic imaging technique. In short, the findings suggest that teaching using hologram technique improves contemplative thinking skills, because the results of this study showed the importance of using this method.

The study of Abdel Hafeez, Mohamed, and Musa (2018) aimed to develop the skills of capturing digital images among students of educational technology through an electronic simulation program among students of the Faculty of Education at Minia University. The study followed the descriptive and experimental approach with its semi-experimental design. The first experimental group (10) students studying using the electronic simulation program and the second experimental group (50) students studying using multimedia were selected randomly. The study tool consisted of an achievement test, an observation checklist, and a product evaluation card for students on the skills of taking digital photos, which were applied pre and post-tests. The results of the research found that there were no statistically significant differences between the mean scores of the students in the two experimental groups in the post-test of the achievement test. The results of the study showed that there was a statistically significant difference between the mean scores of students in the two experimental groups in the post-test of the observation checklist. The results of the study showed that there was a statistically significant difference between the mean scores of students in the two experimental groups

in the post-test of the product evaluation card. The results recommended encouraging the use of digital imaging innovations in the teaching and learning process.

Abdulhady study (2017) also aimed to reveal the attitudes and differences of academic staff and students towards the use of the hologram technique in distance learning in (Faculties of Arts - Faculties of scientific) in Egypt. The study sample consisted of (42) faculty members and (142) students who were selected randomly. To achieve the objectives of the study, the descriptive analytical approach was used. The results indicated that there were no differences at level (0.05) in the attitudes of faculty members towards the use of holograms in distance learning in arts and scientific colleges. The results of the study showed that there were statistically significant differences at level of significance (0.05) between the average estimates of students' attitudes towards the use of holograms in distance learning in arts and scientific colleges, for students of arts colleges. In light of this, the research recommended the importance of introducing hologram technology in distance education in schools and universities and training in its use.

According to Alrwele (2017) the study aims to explore the impact of using images as an approach on Students' Achievement and Attitude towards infographics' impact. Infographics can be effectively and generally used in learning course content and in education to facilitate students' learning environments, intellectual, life skills, and achievement development when visual and information are to be provided together. The sample of study was 165 learners (an experimental group of 83 and a control group of 82) in class activities, and assignments at Al Imam Muhammed ibn Saud Islamic University in Saudi Arabia which were chosen randomly. The quasi-experimental design approach was conducted to experimental group which taught by infographic approach and control group which taught by a traditional method. The measuring tool was pre, posttest test and perception scale of impact's infographic. The results showed that that there was a statistically significant difference between the pretest and posttest scores in favor of the experimental group. It can be concluded that using infographics in (Principles of Curriculum) increases academic achievement and almost 90% of students' attitude levels on their intellectual, life skills, and affective development. It can also contribute to visual and verbal learning levels. Besides, these results can also provide guidance to teachers as they provide alternative and different instructional materials in geography lessons.

Roslan and Ahmad (2017) conducted a study that aimed at examining the effect of using a 3D visual-spatial skills training model on learners' performance in visualization skills in Selangor State School, Malaysia. The study sample consisted of 6 teachers and 50 students. The measuring instruments were a paper 3D visualization skills test and hologram pyramid 3D visualization skills test. The results reveal that the students' visualization skills improved when using the hologram pyramid application. The study also found that students performed better on paper folding tasks but lower on mental spinning task and virtual building component. From the findings, hologram pyramids have a positive effect on students' visualization skills. Therefore, it is likely to be used in the classroom to supplement other teaching and learning resources.

Another study was conducted using hologram technology by Sabry (2016), and its aim was to explore the level of awareness of hologram technology among faculty members at Princess Norah University and its application in distance learning. The study sample consisted of 100 academic staff from colleges of Princess Norah University. The benchmark was a survey of the importance of hologram technology in teaching; obstacles to the allocation of this technology in teaching; and the opinion of faculty members towards the application of this technology in teaching. The most important finding of the

study is the respondents' agreement on the importance of implementing this technique in teaching. The results showed that that there were no statistically significant differences between the level 0.05 and less with regard to the participants' opinions towards all subjects of the study, regardless of the variables of educational level, type of college, and years of experience. This indicates the great awareness of faculty members of the importance of applying such new technologies in the educational field.

Alkahtani and Almoeather (2016) also aimed to reveal the awareness of faculty members of the importance of hologram technology and its application in distance learning, and the obstacles and attitudes toward this technology. The study sample consisted of (100) faculty members at Princess Norah University, who were selected randomly. To achieve the objectives of the study, a descriptive approach was used with a survey tool. The results indicated that there were no differences at level (0.05) in the attitudes of faculty members towards the use of holograms in distance learning in colleges. In light of this, the research recommended the importance of introducing hologram technology in distance education in schools and universities and training in its use.

According to Ahmed (2016) his study focused on the effectiveness of the circular house strategy in developing mathematical concepts and visual thinking among school students. By designing an educational unit using the circular house strategy in Egypt. Two groups of students were selected. The study sample was divided into two groups: an experimental group, which was taught using circular house strategy, and the control group, which was taught by traditional methods. The semi-experimental approach was used to design an educational teaching unit and measure its impact on the development of mathematical concepts and visual thinking among school students among basic stage students in Egypt. The measuring tool was the mathematical concepts test and visual thinking test in the unit of measure. The results showed that there were statistically significant differences between the means scores of the control and experimental groups in the post-test in favor of the experimental group. In short, the findings suggest that teaching using the round house shape is effective in developing students' mathematical concepts and visual thinking, because the results of this study showed the importance of using this method.

According to Çifçi1 (2016) the study aims to detect the impact of using image as an approach on Students' Achievement and Attitude towards Geography Lessons. Infographics can be effectively and generally used in geography lessons in different grade levels and learning environments when visual and information are to be provided together. The principles to produce and design infographics are prepare the goal, topic selecting, easy show, videos, images, sounds, dynamic display, suitable references, and fit with students' level. The sample of study was 113 learners of two private schools in Sivas's region of Turkey, which were chosen randomly. Learners are divided into four groups (1 experimental group consisted of 26 learners, 2 control group of 28, 3 experimental group of 30 and 4 control group of 29) in class activities, and assignments. The quasi-experimental design was conducted to both experimental groups which taught by infographic approach and both control groups which taught by a traditional method. The measuring tool was pre, posttest test and attitude scale of geography lesson. The results showed that there was a statistically significant difference between the pretest and posttest scores in favor of two experimental groups. It can be concluded that using infographics in geography lessons increases academic achievement and attitude levels of the students. It can also contribute to visual and verbal learning levels. Besides, these

results can also provide guidance to teachers as they provide alternative and different instructional materials in geography lessons.

The results of the described studies serve as a starting point for the subject of this research. They guided the researcher in the development of the quasi-experimental design, the procedures for application, and the discussion of the results and their interpretation. Previous studies have primarily focused on the employment of hologram technique in teaching and learning in primary or high school education, while only a few studies have been conducted at universities. Therefore, this research focuses on the use of hologram technology to teach production of 3D images, which did not include much in previous studies at the College of Education at Al-Baha University.

MATERIALS AND METHODS

RESEARCH DESIGN

The quasi-experimental approach was used on one experimental group and one control group to determine the influence of independent variable on a dependent variable, specifically improvement in the proficiency of stereoscopic image and visual imagination, which measured by an observation checklist, achievement test and visual imagination test. The study was conducted for a duration of 4 weeks. The stereoscopic image and visual imagination including the achievement test, observation checklist and visual imagination test were made by the researcher of this study. A sample of students from the college of education at Al-Baha University participated in classes that were taught using hologram technology and traditional method. A quantitative data collection process was selected to provide a general picture of the research problem, and the T test method was used in this study to analyze the data. The quasi experimental design approach including pre- posttest used in the current study. The experimental and control group consisted of students that had not dealt with hologram technology before and who were taught by the researcher prior to the experiment.

PARTICIPANTS

The target study population consisted of male and female postgraduate students in the College of Education at Al-Baha University, who numbered (500) students, according to the statistics of Al-Baha University in the first semester of the academic year (1443-1444). The sample was selected (30) students. The two groups are subjected to the pre-test of the three study tools (the achievement test and the observation checklist test and visual imagination test), then the two groups are subjected to the experimental treatment, and then the three study tools (the achievement test and the observation checklist test and visual imagination test) are applied post-test, which is shown in Table (1).

Table 1

The experimental study

Group	Pre and Post test	Manipulating	Dependent Variable	
The experimental (16 students)	Achievement pretest, observation checklist and visual imagination test (O1)	Teaching using hologram technique(X1)	Achievement, Skills, and visual imagination	Discussion and interpretation of findings
The control (14 students)		Teaching using traditional method(X2)		

STUDY INSTRUMENTS

Three main instruments were developed for answering the questions of the present study, namely an academic achievement test, observation checklist test and visual imagination test.

ACHIEVEMENT TEST

Cognitive achievement test: The objective of the test was to measure the producing holographic images achievement of student sample after studying using hologram technique according to Bloom's cognitive levels.

The test was applied on an exploratory sample of (20) students at the College of Education, Al-Baha University, excluding sample of main study. In order to analyze the test items statistically in terms of difficulty and discrimination coefficients, as well as to extract indications of validity and reliability. To analyze the test items, the researcher applied the test to the sample of (20) students from outside the study sample, and the students were divided into two categories according to the total score on the test (a higher category and a lower category) with (10) students for each category, to extract the coefficients of difficulty and discrimination for the test items.

The objective of the test: To determine the producing holographic images achievement for the study sample after studying the course title " Multimedia " at the college of education at Al-Baha University. The researcher selected the " image processing " unit.

Test description: The test consisted of (30) multiple choice items and each item had four choices, one of which represented the correct answer in light of the content of the producing holographic images skills, with the total score ranging from (0-30) marks.

Table of specifications: The specification table was built based on Bloom's cognitive levels, which are (remember, understand, application). The vocabulary that relates to each level of Bloom's cognitive goals to be achieved for each item has been determined, as the number of the test vocabulary in its final form was (30) with ten questions for every goal.

Validity of the test: The test was reviewed by seven referees specializing in curricula, teaching methods and educational techniques to know their opinions on the components of the test in terms of the scientific validity of its vocabulary; its suitability for students; the relevance and comprehensiveness of the vocabulary to the subject of course, and the accuracy of its linguistic formulation; and the appropriateness of the score for each test question. Consequently, adjustments were made to some vocabulary according to their views by reformulating some questions to become clear, and writing the question head in bold and thus the test became in its final form of application.

Reliability of the test: The test was applied to an exploratory sample consisting of (15) students at the College of Education, Al-Baha University, excluding sample of main study, and the stability coefficient was calculated through the Couder-Richardson equation - 20, and the stability coefficient was (0.86), which is a high stability coefficient suitable for the purposes of the study.

Calculation of coefficients of difficulty and ease of the test vocabulary: The ease factor was calculated for each of the test items, and the ease factors ranged between (0.54 - 0.80). The values of the difficulty coefficients for the test items range between (0.35--- 0.65), which are considered acceptable items, and advised to keep items in the test. The values of the discrimination coefficients for the test items range between (0.20---0.80), which are considered acceptable items, and advised to keep items in the test.

Internal consistency validity

The values of the Pearson correlation coefficients between the items with the total score are statistically significant at the level of significance (0.01), where the correlation coefficients ranged (0.651** --0.944**). This confirms that the test has a degree of validity, which indicates the validity of the tool to measure what it was prepared for.

The Spearman correlation coefficient was calculated based on the scores of the exploratory sample between the total score and the total score of the achievement and observation checklist tests. Table 2 shows the results of the correlation coefficients.

Table 2

Correlation coefficients between the degree of each level and the total score of the achievement test

N	Level	Correlation coefficients
1	Comprehension	0.٧74
2	Recall	0.٧30
3	Application	0.743

Table 2 indicates that the correlation coefficients between the score of each level and the overall test score ranged between 0.٧30 and 0.7٧٤, which are statistically significant at a significance level less than 0.01. This finding indicates that the items of each test level are valid.

OBSERVATION CHECKLIST

The aim was to evaluate the producing holographic images skills of students on the Multimedia course based on their performance. The observation checklist was prepared according to the educational objectives of the program by reviewing the course and meeting a group of specialists in holographic images, as it consisted of 30 skills describing the skill performance of the student in relation to holographic images that they learned in the classroom. The quantifying of the grades for the observation checklist was calculated by direct observation of each student separately, where the grades were distributed according to two levels: performed (1) and not performed (0).

Validity of the observation checklist

The test was reviewed by a group specializing in curricula, teaching methods and educational techniques to ensure the integrity and clarity of the procedural wording of the observation checklist for application. They made any modifications they thought appropriate, including the recommendation to delete three phrases, bringing the total number of elements of the card to 40. The reliability of the observation checklist was **(**0.89), which is a high stability coefficient suitable for the study by Cronbach's alpha.

VISUAL IMAGINATION TEST

Visual imagination test: The objective of the test was to measure visual imagination of student sample after studying using hologram technique in " image processing " unit according to Bloom's cognitive levels.

The objective of the test: To determine the visual imagination for the study sample after studying the course title " Multimedia " at the college of education at Al-Baha University. The researcher selected the " image processing " unit. The content of aspects of visual imagination: Recognizing the visual form of the ٣D image. Representation of the visual shape by converting the normal image into a 3D image. Reading the visual form by

understanding the content of the visual form of the holographic image and describing, explaining, and interpreting its various components. Imagine the visual shape by analyzing the visual into its various components or identifying the different parts of the visual.

Test description: The test consisted of subjective questions (multiple choice) and each item had four choices, one of which represented the correct answer in light of the content of the producing holographic images skills, with the total score of the test being 30 marks.

Table of specifications: The specification table was built based on Bloom's cognitive levels, which are (remember, understand, application). The vocabulary that relates to each level of Bloom's cognitive goals to be achieved for each item has been determined, as the number of the test vocabulary in its final form was (30) with ten questions for every goal.

Validity of the test: The test was reviewed by seven referees specializing in curricula, teaching methods and educational techniques to know their opinions on the components of the test in terms of the scientific validity of its vocabulary; its suitability for students; the relevance and comprehensiveness of the vocabulary to the subject of course, and the accuracy of its linguistic formulation; and the appropriateness of the score for each test question. Consequently, adjustments were made to some vocabulary according to their views by reformulating some questions to become clear, and writing the question head in bold and thus the test became in its final form of application.

Reliability of the test: The test was applied on an exploratory sample consisting of (20) students at the College of Education, Al-Baha University, excluding sample of main study. The reliability was calculated using the Spearman & Brown correlation equation to find the correlation coefficient between the two parts, and then find the reliability coefficient (Al-sayed, 1979). The test reliability coefficient was (0.77) which is an acceptable value that confirms the reliability of the test.

Calculation of coefficients of difficulty and ease of the test vocabulary: The ease factor was calculated for each of the test items, and the ease factors ranged between (0.54 - 0.80)

Internal consistency validity

The Spearman correlation coefficient was calculated based on the scores of the exploratory sample between the total score and the total score of the achievement and observation checklist tests. Table 3 shows the results of the correlation coefficients.

Table 3

Correlation coefficients between the degree of each level and the total score of the achievement test

N	Level	Correlation coefficients
1	Comprehension	0.٧٦٥
2	Recall	0.٧3٣
3	Application	0.74٠

Table 3 indicates that the correlation coefficients between the score of each level and the overall test score ranged between 0.٧3٣ and 0.7٦٥, which are statistically significant at a significance level less than 0.01. This finding indicates that the items of each test level are valid.

THE PROCEDURE OF THE STUDY

A pilot study was conducted prior to the original study to ensure the reliability of this study instruments. The researcher conducted a pilot study with 20 students to identify the time taken to conduct the main study and any potential obstacles. The results of the pilot study indicated that there were no obstacles. Following this, thirty learners from the College of Education were selected to take part in the main study. They were included in the study after being parity tested. The main study consisted of the first experimental group composed of 16 learners who were taught using static infographics, while the second group was composed of 14 learners who were taught using dynamic infographics. Because a random distribution of participants in the research group was prohibited according to university management policies, the study was conducted on students in their original sections. However, pre-experimental measures were incorporated to ensure the equivalence of research groups for the study. The students' assignments for the first group included watching and discussing Internet Concepts on static infographics and the second group watching and listening to dynamic infographics. At the end of the sessions, the test was administered to the participants in both experimental groups as a post-test.

1- Review the literature and previous studies related to the visual approach, its strategies, charts, and static, dynamic infographics.

2- Identify the list of Internet concepts in education: the researcher examined the concepts, analyzed the content of unit, then set a specification table of goals, prepare the study tool (achievement test), interviewed college instructors, and then showed the content analysis.

3- Design the study scenario, including the lesson materials containing either static or dynamic infographics.

4- Divide the sample into two experimental groups.

5- Explain the Internet Concepts unit using static infographics as the teaching method for the first experimental group and dynamic infographics for the second experimental group, then apply the pre achievement test to measure the equalization of both groups then post-test to measure the significant difference between them on achievement.

6- Explain and analyze the results.

7- Select ADDIE design model to design the internet concepts of unit by static and dynamic infographics. Figure (١) indicates to the first stage of instructional design (ADDIE model) of study.

DESIGNING OF hologram technique

The researcher chose the ADDIE general design model to design the experimental material due to its use holographic image strategy in university education and demonstrated the quality of performance and the validity of the results, and allows the learner to progress towards achieving the goals according to his learning rate in terms of time availability and appropriate educational options for the learner and in the end the feedback to know level of cognitive performance and it consists of five stages: analysis, design, development, implementation, evaluation in order to design hologram technique.

The first stage is Analysis

The literature was reviewed on the topic of previous studies related to the use of hologram technology and their impact on preparing the theoretical framework of the

study. Master students have been chosen as the target audience for study and they watched, listened, and used holograms. The study was conducted in the computer lab, where the students had access to computers and phones. The effectiveness of teaching the image processing unit was chosen as the focus of the study, because it contains producing stereoscopic image skills that can be taught effectively using hologram technology. The experimental group studied the unit with the help of 3D and the control group with the help of traditional method. The goals are outputting the educational system, that is to say, what students can do at the end of the educational process. Therefore, setting the goals is one of the most important procedural steps by designing and preparing educational programs in terms of the appropriate content elements, as well as choosing the appropriate media and methods to achieve the objectives of the program. A number of factors were taken into consideration, including: academic factors, including factors affecting the ability of learner to learn skill; the physical environment of the class in terms of sound, light and temperature; the social environment such as the learner's preference to work alone or with a group; the emotional environment such as the learner's motivation, perseverance to work and possibly responsibility; the learning unit of the program, which in this case was devoted to learning image producing skills and visual imagination through phone-based activities using a hologram application such as hologram 3D, holapex, hand spinner 3D and Geometryx and so on to provide activities. For each topic of the unit to determine the student's ability to produce ٣D images and stimulate the student's visual imagination.

The second stage is design

The research’s hologram technology is based on 3D images (created with hologram application) to draw students' attention to the application and aim to teach 30 image producing skills. Data was presented clearly with symbols codes, color, and consistency. The hologram scenario such as logical sequence of subject and its interconnection, sequence of skills, rrelationship of subject to the students' needs, the students' mentality, description of footage, viewing and sequence are drawn besides appropriate text. The images were entered by a scanner and processed using hologram technique. All the texts that appeared on the program screen were entered using a word processing program. stereoscopic image effects were used when program frames appeared and disappeared, in order not to distract the student.

Mmusic and sound effects were used when learning image producing skill. The hologram application was ready to use. The hologram application was introduced to a group of experts and specialists in educational technology and computer science to ensure the availability of the using it, and the appropriateness of evaluating of the image processing course for second year students at the College of Education. A pilot study was conducted to ensure the clarity of the subject, application time for two groups, explain of the experiment, division of groups. The achievement test, observation checklist and visual imagination were based on recall, cognitive and application goals, and were comprised of 30 multiple choice questions to measure students’ memory, comprehension and application. Then, a specification table was drawn up that including a number of questions to measure the effect of computer simulation on the students' skills. The skills of producing a stereoscopic image are such as: image recognition and description, image analysis skill, the skill of linking the relationship in the picture, interpreting ambiguity, and extracting meanings in the image. The achievement test was based on recall, cognitive, and application goals to measure visual imagination of students in production stereoscopic image unit.

The third stage is development

The researcher designed hologram technology, which was entitled “image processing", to teach 30 skills. The researcher began producing and testing of the methodology used in the project, and then presented it to a number of reviewers in the technology department to check the clarity on screen, its availability, and the process of building the computer program. The researcher conducted a pilot study among 20 learners who were not included in the main study sample, to verify the availability, to identify any obstacles that prevent their completion. The time required to conduct the main study with the equation (time spent answering the first student + time spent answering the last student/2). The results of pilot study indicated there was no obstacle to the application and that the time required for each lecture was one hour. Then, the measurement tool was applied in the form of a post test, which recorded the data. The researcher then processed the data statistically, analyzed it and discussed the results, before making recommendations and suggestions in light of the results. The pilot study consisted of 20 learners. The first 10 students finished the test within 25 minutes, while the other 10 finished the test within 30 minutes, so the average was 30 minutes. Cronbach's alpha value was 0.74 indicating that the test had high validity. To determine the difficulties that the researcher faces when applying the study. It is clear from the ease coefficients that ranged from 0.50 to 0.73 and that the difficulty coefficients for the paragraphs ranged from 0.26 to 0.45. That is, the coefficient of ease or difficulty was55%.

The fourth stage is implementation

The researcher examined hologram technology then reviews it in terms of application availability and repetition of mistakes before applying it to the students. The researcher provided contact information in case the students have any inquiries regarding how to use the program. The age of the learners was between 25 and 35 years old. Forty learners participated in the study who were able to manipulate visual and auditory data. The subject being studied by them was Multimedia, and the specific focus of the lesson was “image processing". The experimental group students used (hologram technology), and the control group (usual method) took into account the speed and the time duration. This was compatible with learning conditions and characteristics.

The fifth stage is evaluation

To determine if the goals had been achieved, pre and post-test were taken to measure the students’ skills and visual imagination, taking into account the feedback received from the learners. After that, the data was recorded and monitored, and then the data was processed statistically, analyzed and the results were discussed. The researcher presented recommendations and suggestions in light of the results. The achievement test and observation checklist were conducted to measure the study achievement and skills for both groups.

STUDY VARIABLES

1- **First**: the independent variables: the hologram technology (3D).

2- **Second:** The dependent variable: stereoscopic images producing skills and visual imagination.

RESULTS AND DISCUSSION

After completing the implementation of the hologram technology and observing the students' performance. The t-test for the two independent samples was conducted to

measure the stereoscopic images producing skills and visual imagination of the two groups in terms of the stereoscopic images' unit during the post-test.

To answer this question, the null hypothesis was formulated, which states:

1- There is a statically significant difference in the level of (0.05) between the mean scores of the experimental group- using a hologram technology and the control group using a usual method on the achievement post-test due to the program.

In order to demonstrate the impact of the application of the hologram technology via mobile phones in developing the achievement of producing stereoscopic images among postgraduate students, the researcher used the t-test to demonstrate the significance of the differences between the arithmetic means between the scores of the control and experimental groups on the achievement test in the post-test. The table (4) shows that:

Table 4

T-test to show the significance of the differences between the arithmetic means between the scores of the control and experimental groups on the achievement test in the post-test

Test	Group	N	Mean	Std.Deviation	T value	Df	Sig.(2-tailed)	Effect size Eta Square
Achievement	Control	14	17.79	3.641	-2.393-	28	.024	.170
	Experimental	16	21.63	4.938				

Table (4) shows that there are statistically significant differences at the level of significance (0.05) between the arithmetic means of the scores of the students of the experimental and control groups on the post-test of the achievement test, in favor of the experimental and with a large effect size. The findings are consistent with those of previous studies (Noureldin, Stoica, Kaneva & Andonian, 2016; Alkofahi, Bin Jamaludin, Ng, 2015) that there was statistically significant difference between the mean scores of the experimental and control groups in the post- achievement test, the observation checklist and the imaginary test related to holographic image producing skills.

2- There is a statically significant difference in the level of (0.05) between the mean scores of the experimental group- using a hologram technology and the control group using a usual method on observation checklist post-test due to the program.

In order to demonstrate the impact of the application of the hologram technology via mobile phones in developing the skills of producing stereoscopic images among postgraduate students, the researcher used the t-test to demonstrate the significance of the differences between the arithmetic means between the scores of the control and experimental groups on the observation checklist test in the post-test. The table (5) shows that:

Table 5

T-test to show the significance of the differences between the arithmetic means between the scores of the control and experimental groups on the observation checklist test in the post-test

Test	Group	N	Mean	Std.Deviation	T value	Df	Sig.(2-tailed)	Effect size Eta Square
Observation checklist	Control	14	15.71	3.625	-4.561-	28	.000	.426
	Experimental	16	22.50	4.412				

Table (5) shows that there are statistically significant differences at the level of significance (0.05) between the arithmetic means of the scores of the students of the experimental and control groups on the post-test of the observation checklist test, in favor of the experimental and with a large effect size. The findings are consistent with those of previous studies (Noureldin, Stoica, Kaneva & Andonian, 2016; Alkofahi, Bin Jamaludin, Ng, 2015) that there was statistically significant difference between the mean scores of the experimental and control groups in the post- the observation checklist test related to holographic image producing skills.

3- There is a statically significant difference in the level of (α≤0.05) between the mean scores of the experimental group- using a hologram technology and the control group using a usual method on visual imagination post-test due to the program.

In order to demonstrate the impact of the application of the hologram technology via mobile phone in developing the visual imagination of producing stereoscopic images among postgraduate students, the researcher used the t-test to demonstrate the significance of the differences between the arithmetic means between the scores of the control and experimental groups on the visual imagination test in the post-test. The table (6) shows that:

Table 6

T-test to show the significance of the differences between the arithmetic means between the scores of the control and experimental groups on the observation checklist test in the post-test

Test	Group	N	Mean	Std.Deviation	T value	Df	Sig.(2-tailed)	Effect size Eta Square
Imaginary	Control	14	15.86	3.759	-4.413-	28	.000	.410
	Experimental	16	22.50	4.397				

Table (6) shows that there are statistically significant differences at the level of significance (0.05) between the arithmetic means of the scores of the students of the experimental and control groups on the post-test of the imaginary test, in favor of the experimental and with a large effect size. The findings are consistent with those of previous studies (Noureldin, Stoica, Kaneva & Andonian, 2016; Alkofahi, Bin Jamaludin, Ng, 2015) that there was statistically significant difference between the mean scores of the experimental and control groups in the post- imaginary test related to holographic image producing skills.

The results indicated that there were statistically significant differences in the achievement, skills and visual imagination mean groups, as shown in Table 4, 5 and 6. The researcher attributed this to the impact of hologram application, as the learners increased their achievement skills and visual imagination, thus indicating that hologram application is a more effective method than usual method. Moreover, it was more effective at presenting the skills and information required, as well as the maps attractively. The findings revealed that the experimental group did significantly better than the control group in terms of their achievement and skills. The results indicate that the use of hologram technique can influence students' achievements in the subject of holographic image producing skills.

The findings are consistent with the previous studies (De boer, Wesselink & Vervoom, 2015; Ashraf, Collins, Whelan, Sullivan & Balfe, 2015; Park, Kim & Sohn, 2011; Hassan, 2014) byÇifçi1 (2016) and Alrwele (2017) on the effect of hologram technology at

developing stereoscopic images processing knowledge due to it being faster, presenting visual knowledge more clearly, and having fewer mistakes and taking less time than usual method. The results of this study are not consistent with previous studies Alshehri (2016) Dlamini (2015) about the effect of hologram technology.

CONCLUSION

The purpose of the study was to examine the effect of hologram technology to develop a number of stereoscopic images producing skills and visual imagination among graduate students at the College of Education, Al Baha University. The results revealed that there were statistically significant differences at a level of 0.05 between the mean scores of students from the experimental and control groups in the post achievement test, observation checklist test and visual imagination test, with the results in favor of the experimental group that used hologram technology. This indicated that hologram technology is more effective in the learning and teaching of stereoscopic image producing skills and visual imagination than usual method.

RECOMMENDATIONS FOR STUDY

1. It is important to customize the design of the hologram technology to the teaching according to the subject.

2- The need to use the technological approach - through the use of different educational techniques - in formulating and teaching multimedia content. In a way that helps to develop the skills of producing different stereoscopic images among students in general, and the skills of visual imagination in particular.

3. Encourage the administration and professors in every department of Al-Baha University to use holograms in their teaching.

4. Use hologram technology when teaching stereoscopic image producing skills to master students because of the proven increase in acquiring holographic image producing skills, with an emphasis on three- dimensional simulation, as it showed greater effectiveness on students' academic achievement, skills, and visual imagination.

SUGGESTIONS FOR FUTURE STUDY

1.A comparative study of the effect of using hologram technology on developing the production of static and dynamic images skills and visual imagination, the academic achievement and learning styles of students of different educational stages.

2. A study of the effectiveness of software based on hologram technology in the development of design skills among students.

3. A study of the effect of using visual input on developing the ability to produce stereoscopic images and the attitude towards it among postgraduate students.

4. Investigating the effectiveness of using cartoons in acquiring multimedia concepts for postgraduate students.

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