

## **Developing and Implementing an Educational Program for Academic Teaching Staff about Digital Hologram Technology as an Active Learning Strategy**

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### **Abstract**

**Background:** Holographic projection is the new wave of technology that will change how we view things in the future; it will have tremendous effects on all fields of life including education and science. **Aim:** To develop and implement an educational program for academic teaching staff about digital hologram technology as an active learning strategy. **Design:** A quasi-experimental design. **Setting:** Faculty of Nursing at Assiut University. **Study subjects:** All academic teaching staff (No= 113). **Study tools:** Tool (1): Demographic and work-related characteristics: including age, educational degree, marital status, and years of experience. Tool (2): Hologram questionnaire: used to measure knowledge of academic teaching staff about digital Hologram. Tool (3): Program implementation & evaluation sheet it developed by the researchers and which consisted of outcome of the program. **Results:** the highest mean score was in post educational program in all items and highly statistically significant differences between the studied subject in knowledge pre, post and follows up. **Conclusion:** There were marked improvements in participants' knowledge immediately after implementation of the educational program. **Recommendation:** Further research studies are needed to evaluate academic staff skills of hologram technology, assess administrative interventions to manage organizational technology to applicants this phenomenon.

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**Keywords:** Educational Program, Hologram, Technology, Academic Teaching Staff.

### **1. Introduction**

Learning in the traditional model is usually described as didactic instruction where

information is given to students. In the traditional learning, the only information giver is the teacher who gives lectures to

students and students sit in the classroom as passive recipients of the information. ICT started from computer integrated technology which provides knowledge to students through power point presentation and projector technology in the classroom. Nowadays, interactive learning for students is possible (Elmarash, et al, 2021).

In recent years, technology has opened up new educational opportunities and transformed the way we learn. In particular, what the 3D hologram technique now provides in various fields of science and training can be considered as a good way to teach. It can be argued that the very concept of being able to see an image in 3D is inspiring in itself. The learner feels the presence of the object in 3D and is more inclined to learn. (Wu, etal, 2019).

Holography can be alluding to as a strategy of getting photographic picture in three measurements (Ahmad, 2014). It includes the utilize of a laser, impedances, and avoidance, light escalated recording and appropriate light of the recording indicated that the term 3d image be composed of the Greek terms, "holos" for "entire see" and gram for "composed". Be that as it may, the specialized term for the holography is wave front recreation (Upadhye, 2013).

Holograms contrast from standard photos, since the 3d images record a greatly precise three-dimensional (3D) picture of the initial object. A hologram may be a three-dimensional record of the positive obstructions of laser light waves. The structure of a manufactured holograms is made of thousands of 3D computer realistic pictures comparing to as much focuses of see on a three-dimensional scene. Holography takes us a step encourage by bringing the virtual environment into our physical nearness (Awad & Kharbat, 2018).

Holograms moreover permits the educators to view the first gallery collection artifacts inside the setting of the show within the classroom, empowers the understudies moreover to choose up, pivot, scale, and select their claim show or customize an existing one by choosing objects from a virtual exhibition and putting them inside the physical world, and they can moreover ask more data almost any artifact within the collection (Pietroni, et al., 2019).

In nursing instruction, blended reality gives an instinctive and agreeable way of learning for today's computerized locals and to help the advancement of physical appraisal

abilities, upgrade understanding of life structures and physiology, and to move forward the information, aptitude, and certainty of nursing understudies (**Foronda, 2017**).

A major benefit of utilizing intelligently digital technology is that understudies take an dynamic portion in their learning which makes a difference them to develop unused information and aptitudes inside their individual situations (**Garrett, et al.,2018**). Is a viable way for understudy medical attendants to create appraisal abilities where there's no hazard to patient safety. Besides, employing a standardized computerized 'patient' gives a reliable learning involvement for medical attendants with the included advantage of them feeling less self-conscious almost partaking in a nursing reenactment (**Ditzel& Collins, 2021**).

### **Significant of the study**

3D Hologram as a new tool which could support teaching and learning in educational institutions. For that, to understand the importance of 3D Hologram technology in the learning environment, identify the strengths and weaknesses of 3D Hologram technology as a teaching tool and identify the barriers with this technology and can be used

to assist the development of clinical reasoning skills among undergraduate (pre-licensure) Bachelor of Nursing (BN) degree students. Three international studies were identified during the researcher's review of the literature. The first was titled " Using 3D Hologram Technology (3DHT) in the Distance Learning Program to Enhance the Professional Skills of Tour Guidance Undergraduate Students " done by **Abdelhamid, (2020)**; the second was titled " 3D Hologram Technology in Libyan Educational Institutions in Future " done by **Elmarash, et al, (2021)**; and the third one was titled " Holograms in nursing education: Results of an exploratory study" done by (**Ditzel& Collins, 2021**). Furthermore, there were no regional, national, or worldwide studies about Hologram. So, the researchers intended to study the phenomenon.

### **Aim of the study**

To develop and implement an educational program for academic teaching staff about digital hologram technology as an active learning strategy.

### **Research hypothesis**

H. Lower than half of academic teaching staff have enough knowledge about digital Hologram.

## **2. Subject and Methods**

### **Study Design**

A quasi-experimental design utilized for the current study.

### **Study Setting**

This study carried out in Faculty of Nursing at Assiut University.

### **Study Subject**

A convenience sampling used for this study. All academic teaching staff working in Faculty of Nursing at Assiut University with total number (no= 113).

### **Data collection tools**

#### **Tool (1): Demographic and work-related characteristics:**

Self-administered questionnaire developed by the researchers and including age, educational degree, marital status, and years of experience in work.

**Tool (2): Hologram questionnaire:** developed by the researchers after reviewing related literature **Elmarash, et al. , (2021)** It used to measure knowledge of academic teaching staff about digital hologram before and immediately after implementation of the program which includes the definition of hologram, uses, types, importance, how

work, characteristics, how can design simple Hologram and the best application for Hologram . The questionnaire was open end questions.

**The scoring system:** for questionnaire was calculated for each item as follows: correct and the complete answer was scored (two points), incomplete answer was scored (one point), and the wrong answer was scored (zero points).

Scores were transferred into numbers and percentage the total score for all questions: The score of the items was summed-up and the total divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score.

The total knowledge scores (58 degrees) and it was considered good if the scores of the total knowledge  $\geq 75\%$  ( $\geq 43.5$  degrees) while considered average if it equals 60 -  $< 75\%$  (from 34.8 -  $< 43.5$  degree), and considered poor if it is  $< 60\%$  ( $< 34.8$  degree)

**Tool (3): Program implementation & evaluation sheet:** it developed by the researchers and which consisted of: **Outcome of the program:** through the use of a structured questionnaire which used to evaluate cognitive skills of program content through pre, immediately post and follow up

tests after three months later. The test was completed in about half an hour.

### **Administrative design**

An official permission will obtain from Dean of the Nursing Faculty of Assiut University, and academic teaching staff and explaining the purpose of the study, and asking them for their oral consent to participate.

### **Operational design**

**1) Preparatory phase:** The research proposal was completed after an examination of the pertinent academic literature on the subject, which took place one month between the beginnings of January 2023 to the beginning of February 2023. It was done to translate the research tool into Arabic.

**1) Ethical considerations:** Research proposal approved from Ethical committee at the Faculty of Nursing, Assiut University. The study was followed common ethical principles in clinical research, then written agreements were taken from all participants to participate in the present study, study participants have the right to refuse/ participate/ withdraw from the study without any rational at any time, confidentiality and anonymity were assured, and study participants privacy was considered during

collection of data, all obtained data were used only for research purpose.

**2) Faced validity:** was done to assure accurate comprehension of the study tool, which was done through a jury (expert opinions) composed of 3 professors and 2 assistant professors from the Nursing Administration and Community Health Nursing Departments, Faculty of Nursing, Assiut University.

**3) Content validity:** was checked and analyzed using confirmatory factor analysis test to assure (importance, clearness, and accountability of each items of the study tool) and its result was  $\geq 1.2$  for all items of the study tool, so all items in the study tool were confirmed.

**4) Pilot study:** Serves to test the feasibility, clarity, and practicability of the data collection tool. It was carried out on 10% from different department in Faculty of Nursing at Assiut University. The pilot study was collected in April 2023. After the pilot study, no modifications were made, so the teaching staff who participated in the trial were also included in the whole sample. The program was planned and designed based on the need assessment which were performed

prior one week from program planning and actually implementation of the program. The data were collected by the researchers through distributing questionnaire form for (113) academic teaching staff. Then the researchers had explained the purpose of the study. The time taking with each participant was from 20-30 minutes. The data obtained from need assessment used as a guide in preparing the program content.

**II) Implementation phase:** This phase took place one month from the end of May 2023 to the beginning of June 2023. Planning and developing education program include formulating program objectives (general and specific), the content and methods of teaching was selected after careful study of teaching staff needs. The subject materials were organized according to needs' priority. The selection of teaching methods was carried out according to the subjects and the educational principles. The methods used were lectures, posters, and audiovisual aids. Teaching aids used to help for the attainment of the objectives were booklet and power point presentation. The program was implemented by the researchers on the representative subject (113) teaching staff for two days, divided into two groups; every

group was (57) academic teaching staff. The total time of the program was 20 hours distributed into 10 sessions for each group, 5 sessions every day.

The program content includes the following: definition & types of holograms, how create of hologram, uses of hologram, characteristics of hologram technology, importance of holograms in education, how can a simple hologram be designed, what are the best hologram applications for mobile devices and what are the most important and most advanced technologies.

**III) Evaluation phase:** Post-test immediately after implementation of the program (by using a tool II and to evaluate the change in the academic teaching staff's knowledge regarding digital hologram.

#### **Statistical analysis**

The Statistical Package for Social Sciences (SPSS) V.26 was used to organize, categories, code, tabulate, and analyze the obtained data. Results were shown as numbers, percentages, averages, and standard deviations in tables and charts. Statistical significance was determined to exist at a P-value of 0.05.

### 3. Results

**Table (1):** Shows that, the highest percentage of them are assistant professor, their age from 40 to less than 45 years old. Also, the table illustrated that, the studied subjects are married, and having experience from 10 to more than 15 years (**81.4%, 68.1%, 64.6% and 38.9%**) respectively.

**Table (2):** shows that, the highest percentage of the studied subject had unsatisfactory knowledge as regard to the all items of the assessment phase questions.

**Table (3):** Reveals, that, the highest statistically significant differences between the studied subject' knowledge in pre, post and follows up regarding the hologram technology ( $P= 0.001$ ).

Table (4): Shows that, the highest mean score was in post educational program in all items and there were highly statistically significant differences between the studied subject in knowledge pre, post and follows up as regard to the all-educational program content items ( $P= 0.001$ ).

### 4. Discussion

The role of technology in education Technology has revolutionized the learning

process and provided teachers with new and innovative ways to teach students The integration of technology into education has had a positive impact on learners and instructors Technology improves control, transmission, and acquisition of information by learners (Alghamdi, 2020).

This study found that the majority of the studied subjects had poor knowledge on all of the assessment phase items. This could be due to the teaching staff's lack of knowledge about holograms and the fact that it was a new subject for them. This is in line with the findings of **Ditzel and Collins (2021)**, who noted that there is still very little knowledge about how digital technologies, such as holograms, can be used to help develop clinical reasoning skills in teachers.

According to the current findings, the post-educational program had the highest mean score across all items, and there were highly significant statistical variations in the examined subject's knowledge regarding the pre-, post-, and follow-up items related to the content of the entire program. This translates to an increase in overall subject knowledge across all post-education program components. This result is in line with the

findings of **Katsioloudis & Jones (2018)**, who stated that it's critical to realize that a new instructional technology's efficacy is closely linked to both its users' performance and the capabilities of the tool itself. indicates that the capabilities of a specific media or technology combined with the suitable instructional methods in relation to the learners.

However, **Elmarash et al. (2021)** claimed that technology offers fresh perspectives on education and gives the process of learning a new purpose. particularly what the 3DHologram technology currently offers in a variety of science courses and training courses to think of it as an effective teaching method.

According to **Ahmed et al. (2024)**, a variety of technologies are used to produce and present 3D visual content. Two of the most significant technologies for 3D display are hologram and augmented reality, both of which add a three-dimensional image to the physical world. However, there are a number of key distinctions between the two technologies. After defining and comparing the two technologies and the effect of each one on education, Hologram technology showed features that enabled it to be a

suitable option to be used in education for displaying 3D educational content and the method for implementing the usage of Hologram technology in education as a 3D educational content displaying tool, introducing an implementation model by first transferring a sample of a 2D educational image to Holograms and using the Hologram fan projector to display it to the students.

As the researcher point of view, there is a good chance that people will accept the use of holograms in place of more conventional 2D content in school curricula. This will encourage the development and implementation of educational programs aimed at improving public perceptions of the phenomenon's application.

**Generally**, the study's findings showed that, as soon as the program was put into place, the majority of the subjects were adequately informed about all of the material covered. Finally, the fact that the participants stopped using the handouts they had been given during the educational program because they were too busy to read them all due to work overload emphasizes how important continuing education is. In this regard, **Dutta (2023)** highlighted that the majority of forgetting happened as a result of

information being stored in short-term memory. This study's findings are consistent with the possibility that study participants may lose their capacity to recall long-term memory-related information, which can also lead to forgetting this agree with the present study.

## **5. Conclusion**

*In the light of the study results, the following conclusions can be drawn:*

The majority of the subjects under study exhibited inadequate knowledge of holographic technology during the assessment phase. However, following program implementation, there were statistically significant differences in the subjects' knowledge of all program content items in the pre-, post-, and follow-up phases. Participants' knowledge significantly improved as soon as the instructional program's content was put into practice. After three months (follow-up), the improvement was largely maintained, showing a small decrease from the post-implementation level but still being higher than before.

## **6. Recommendation(s)**

As a result of the findings, administrators and university organization must assist faculty deans in integrating this technology into student instruction. The ensuing suggestions can help you accomplish this: - Monitor how the participant feels about holographic technology through ongoing assessments of knowledge retention. Periodically, refresher courses on holographic technology should be offered to academic staff to help them become familiar with the latest developments. Urging the attendees to read in order to refresh and enhance their knowledge. Establishing a small library with the departments will help achieve this. More research is required to assess the holographic technology skills of academic staff and the administrative interventions used to manage organizational technology for applicants. Further research studies are needed to evaluate participants knowledge about hologram application & assess interventions regarding hologram attitudes to manage in the organization.

**Table (1):** Percentage distribution of personal characteristics of the studied subject included in the educational program.

Items	No.	%
<b>1-Age: (years)</b>		
< 35↓	16	14.2
35 - < 40↓	10	8.8
40 - < 45↓	77	<b>68.1</b>
45 - < 48↑	10	8.8
<b>Range:</b> 22- 48↑ years.	<b>Mean ± SD</b> 31.9 ± 6.9	
<b>3-Level of education:</b>		
Professor	11	9.7
Assistant Professor	92	<b>81.4</b>
Lecturer	10	8.8
<b>4-Marital status:</b>		
Single.	37	32.7
Married.	73	<b>64.6</b>
Divorced.	2	1.8
Widow.	1	0.9
<b>5-Years of experience:</b>		
<5↓ years.	40	35.4
5-<10↓years.	29	25.7
10-≥ 15↑ years.	44	<b>38.9</b>

**Table (2):** Percentage distribution of the studied subject knowledge regarding to all items of the assessment phase question (n= 113).

Items	Total score	Mean $\pm$ SD	Unsatisfactory		Satisfactory	
			No.	%	No.	%
1. Definition & types of holograms.	9	5.1+3.7	64	<b>56.6</b>	49	43.4
2. How create of hologram.	17	8.5+6.4	72	<b>63.7</b>	41	36.3
3. Uses of Hologram.	6	2.6+2.3	78	<b>69.1</b>	35	31.0
4. Characteristics of hologram technology.	6	3.1+2.4	71	<b>62.9</b>	42	37.2
5. Importance of holograms in education.	3	1.6+1.2	71	<b>62.9</b>	42	37.2
6. How can a simple hologram be designed.	5	2.3+1.8	80	<b>70.8</b>	33	29.2
7. What are the best hologram applications for mobile devices.	111	65.1+22.5	83	<b>73.4</b>	30	26.5
8. What are the most important and most advanced technologies.	93	54.7+19	84	<b>74.4</b>	29	25.7

**Table (3):** Percentage distribution of the studied subject' knowledge regarding the three period tests of the educational program.

Items	Pre		Post		Follow up		Pre – post		Pre – follow up		post – follow up	
	No.	%	No.	%	No.	%	X <sup>2</sup> 1	P1. Value	X <sup>2</sup> 2	P2. Value	X <sup>2</sup> 3	P3. value
1. Definition & types of holograms.	0	0.0	101	88.6	77	68.2	26.4	0.001**	25.8	0.001**	1.2	0.061
2. How create of Hologram.	0	0.0	102	90.9	101	88.6	23.8	0.001**	23.6	0.001**	1.4	0.889
3. Uses of Hologram.	2	4.5	105	95.5	83	72.7	17.4	0.001**	17.1	0.001**	1.7	0.054
4. Characteristics of hologram technology.	0	0.0	100	86.4	90	79.5	16.9	0.001**	16.3	0.001**	1.1	0.641
5. Importance of holograms in education.	0	0.0	101	88.6	102	90.9	18.2	0.001**	17.8	0.001**	0.3	0.898
6. How can a simple hologram be designed.	0	0.0	105	95.5	82	70.5	25.9	0.001**	25.4	0.001**	1.2	0.063
7. What are the best hologram applications for mobile devices.	0	0.0	101	88.6	103	93.2	14.4	0.001**	14.1	0.001**	0.6	0.729
8. What are the most important and most advanced technologies.	0	0.0	102	90.9	85	75.2	23.9	0.001**	23.4	0.001**	1.8	0.09

**Table (4):** Mean scores of the studied subject total knowledge regarding the educational program content in three period tests.

Items	Pre	Post	Follow up	Pre – post		Pre – follow up		post – follow up	
	Mean ± SD			T1	P1. Value	T2	P2. Value	T3	P3. Value
	Definition & types of holograms.	1.3± 2.4	19± 2.3	17.1± 2.1	7.1	0.001**	6.4	0.001*	4.05
How create of Hologram.	1.66 ± 2.61	8.32 ± 1.38	7.22±0.79	6.6	0.001**	6.4	0.001*	4.59	0.001*
Uses of Hologram.	1.1± 2.6	20.5± 3.3	18.4± 2.9	6.4	0.001**	5.9	0.001*	3.17	0.002*
Characteristics of hologram technology.	1.2± 1.8	14.9± 2.3	13.4± 2.1	4.4	0.001**	4.2	0.001*	3.2	0.002*
Importance of holograms in education.	20.98 ± 8.55	36.93 ± 0.45	36.93 ± 0.45	5.7	0.001**	5.4	0.001*	0	1.000*
How can a simple hologram be designed.	1.61 ± 2.68	15.3 ± 1.92	14.2±0.98	11.2	0.001**	9.8	0.001*	3.4	0.001*
What are the best hologram applications for mobile devices.	19.64 ± 9.76	30.86 ± 0.55	30.86 ± 0.55	8.4	0.001**	7.7	0.001*	0	1.00
What are the most important and most advanced technologies.	1.66 ± 2.61	9.32 ± 1.38	8.22±0.79	6.6	0.001**	6.4	0.001*	4.59	0.001*

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