Skills of using the Sketch up program in producing three-dimensional learning elements

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Abstract

The aim of the current research is to develop the skills of stereoscopic learning elements among graduate students. This research belongs to the category of development research that uses some descriptive studies methods (descriptive survey, systems development) in the phase of study, analysis, design, and experimental approach when measuring the impact of the independent variable of research on the dependent variable. In the evaluation stage, then applying the research tools (achievement test - note card - product evaluation card) before and after on an intentional sample of (30) graduate students - full-time diploma - Mansoura University, they were divided into two experimental groups, each group (15) students , The first experimental group uses the linear sailing pattern, and the second experimental group uses the grid pattern, and the training was conducted in a three-dimensional learning environment, and the research results concluded that the grid sailing pattern is the most influential pattern on the production of stereoscopic learning elements.

Keywords: Skills; Sketch up; producing three-dimensional learning elements.

1. Introduction

3D environments are technological innovations that provide a wide range of services to support teaching and learning activities, manage student learning processes and organize revision, and although e-learning environments support most of these features, there are some limitations that cause a decrease in the efficiency of e-learning, Including that learning in these environments is centered around the learner, and that the possibility of interaction is limited, which is reflected in the decline of the teacher's abilities, the loss of control on the part of the learner, and the prevention of the development of independent educational skills. (Yaser and Adiguzel, 2010, p583)

Some limitations in traditional e-learning environments can be bypassed due to the tools provided by 3D environments. Although these platforms are not designed for educational purposes, they have the potential to create learner-centered environments from teacher-centered ones, and can be improved the educational process through educational methods that focus on the learner, promoting constructivism and problem-based learning (Ismail Muhammad, 2018, pg. 788)

While sailing patterns are one of the most important pillars for designing and producing three-dimensional learning environments, because they give the student a measure of freedom and ease to access the information to be learned first. (2015, p. 195) that navigation patterns are among the most important elements that need to be taken care of because they allow the possibility of returning to reference points, and stresses that the structure of educational environments is very complex, which requires the use of various methods and tools for navigation that simplify dealing with these environments.

Moustakis, Litos Dalivigas, Tsironis (2012, p 62-63) point out that navigation tools should be placed near relevant data fields, and should always give an opportunity to return to the "home page", that the tool reflects the identity of the electronic environment, given It has a unique feature, is easy to use, is

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consistent with the information presented through it, and provides the learner with a sense of comfort, and this is one of the criteria for the quality of designing navigation tools.

The design of three-dimensional learning elements is one of the most important areas that are characterized by privacy and distinction in teaching, because it is effective by itself or in combination with other media in clarifying ideas and attracting them from the abstract world to the visible and tangible world, in addition to that many modern technologies have become partially dependent on them. Or total, as is the case in virtual reality and augmented reality, and a study (Scott, 2012) indicated that the use of 3D models in the educational process leads to an increase in students' grades and increases their motivation to learn.

Stereoscopic elements are one of the basic building blocks of computer graphics, as they are a mathematical representation of any three-dimensional object in a software environment that is viewed from any angle and can be modified and rotated using specialized programs. The object, where it is in the scene, or where it is from the camera (Slick, 2016).

Falco (2012, p 385) stated that the three-dimensional learning element includes many elements that, when combined, produce a three-dimensional digital learning element, so the three-dimensional element consists of (three-dimensional elements, lighting, camera perspective / vision, depth of field, fine detail, surface texture).

In this research, the researcher will use the open-source SketchUp program to produce stereoscopic learning elements, and this program takes into account all previous methods in order to obtain a three-dimensional appearance of the desired shape, so that the student can produce a stereoscopic educational element that simulates the properties of realistic elements, and he can also see the element from all its aspects. Memorizing it and extracting it in a way that suits its purpose, and according to the appropriate learning method for him, and this increases his immersion in learning.

2. Related Work (Methods)

search limits:

This study will be limited to a set of limits, which are as follows:

• Human limits: postgraduate students - full-time diploma - and their number is (30).

• Objective limits: limiting the skills of producing stereoscopic learning elements through SketchUp program.

Justifications for choosing SketchUp:

• Small space compared to graphic programs.
• It does not require huge device capabilities to install and work on it.
• Its ease of use, you can learn it in just one week.
• Show the dimensions and dimensions on the three-dimensional models.
• Supports writing in Arabic without any additions.

Rationale for choosing a linear pattern:

• basic.
• Common in e-learning programs.
• Leads the learner towards information and the way to perform the skill in one direction.
• Helps develop performance skills (production of stereoscopic learning elements).

The rationale for choosing the grid pattern:

• Gives alternatives in front of the learner and he must choose the appropriate alternative.
• It is used in Windows forked programs.
• It leads to better learning outcomes, and reduces the time spent on learning.

time limits:

• This study was carried out in the first semester of the academic year 2021/2022 AD.

spatial boundaries:

• The application was carried out at the Faculty of Education, Mansoura University, Dakahlia Governorate.

Research Methodology:

The researcher followed the following research methods:

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• Analytical descriptive approach: which describes the research problem and the data associated with it. This approach was used in the current research to describe and analyze previous research and studies. In order to list the literature, research and previous studies in the theoretical aspect of research, which are concerned with research variables.

• Experimental Research Method: When conducting a research experiment based on studying the impact of the independent variable represented in (the pattern of navigating a three-dimensional learning environment) on the skills of producing stereoscopic learning elements.

search variables:

The variables of the current research lie in the following:

Independent variable: 3D environment.

taxonomic variables:

Two sailing modes:

• Linear mode.

• Network mode.

Dependent variables: The research includes:

• Develop the cognitive aspect of the skills of producing stereoscopic learning elements.

• Develop the performance aspect of the skills of producing stereoscopic learning elements.

• Developing the quality of the final product for the production skills of stereoscopic learning elements.

search tools:

The researcher built the following research tools:

• Testing the cognitive aspects of the production skills of stereoscopic learning elements (prepared by the researcher).

• A note card for the performance aspects of the production skills of stereoscopic learning elements (prepared by the researcher).

• Product quality assessment card (prepared by the researcher).

Experimental design of the research:

In light of the independent variable of the research; The following experimental design is most suitable according to the nature of the research:

pre measurement	Linear sailing	web surfing	Telemetry
• achievement test • Note card	1	2	•achievement test • Note card •Product Rating Card

Research hypotheses:

The current research sought to verify the following hypotheses:

• There are statistically significant differences at the level (0.05) between the average ranks of the students of the two experimental groups in the post-measurement of the cognitive aspects of the production skills of stereoscopic learning elements.

• There are statistically significant differences at the level (0.05) between the average ranks of the students of the two experimental groups in the post-measurement of the performance aspects of the production skills of stereoscopic learning elements.

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• There are statistically significant differences at the level (0.05) between the average ranks of the students of the two experimental groups in the post-measurement of the product evaluation card.

Search steps:

Reviewing the literature and previous studies related to the research variables, which concerned the patterns of navigation in the three-dimensional learning environment, and the skills of producing stereoscopic learning elements.

• Preparing a list of skills for the production of stereoscopic learning elements needed for graduate students.

• Preparing an instructional design by referring to the instructional design models and choosing what is appropriate for the study.

• Preparing a list of criteria for designing a three-dimensional environment based on the effect of different sailing style (linear / grid).

• Preparing a list of educational objectives for the educational content.

• Preparing educational content according to the established method.

Preparing research tools: and presenting them to a group of experts and specialists in the field of curricula, teaching methods and educational technology to ensure their suitability for application, make the necessary adjustments, and verify their validity and reliability, represented in (achievement test - note card - final product quality assessment card).

Conducting the exploratory experiment to search on a pilot sample to calculate the stability of the tools.

Conducting the basic experiment for the study according to the following steps:

• Quasi-experimental design of the research.

• The research sample.

• Apply the study tools beforehand, except for the product evaluation card.

• Implementation of basic research experience.

• Applying remote study tools.

• Conducting statistical processing and statistical analysis of the data resulting from the two applications.

• Discussing, analyzing and interpreting the results.

• Providing recommendations and suggestions.

3. **Results:**

Application of measurement tools to search by advance

The research tools consisted of an achievement test that measures the cognitive aspect of the skills of producing stereoscopic learning elements among graduate students, and a note card for students' performance of performance skills to produce stereoscopic learning elements, as each tool was applied on a separate day from the other so that it would not be a burden on the student for each of the two groups' students.

Ensure that the two experimental groups are equal:

Table 1: The significance of the differences between the two experimental groups in the tribal measurement of the achievement test for the production skills of stereoscopic learning elements.

Variable	the group	N	average rank	Indication level
Collection	1	15	28.77	Non function
	2	15	33.47	

It is clear from the table that there are no statistically significant differences between the two experimental groups in achievement between the average scores of the students of the two experimental

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groups in the tribal application at each level of the test separately and the test as a whole. This means that there are no statistically significant differences between the four experimental groups, and this means that the two groups are equal in terms of general collection.

Table 2: The significance of the differences between the two experimental groups in the tribal measurement of the observation card of production skills of stereoscopic learning items

Variable	the group	**N**	average rank	Indication level
the performance	1	15	29.07	Non function
	2	15	33.67	

It is clear from the table that there are no statistically significant differences between the two experimental groups in the performance of stereoscopic learning elements production skills between the average scores of the students of the two experimental groups in the tribal application in each of the card skills separately and the card as a whole. This means that there are no statistically significant differences between the two experimental groups, and this Equivalence of groups in the performing skills to produce stereoscopic learning elements.

Table 3: connotation the differences between averages sort the two groups the two trials in measurement dimensional to test sides Cognitive for skills Produce elements learning stereo

Variable	the group	sailing style	N	average rank	value K2	degree of freedom	Indication level
collection	1	Linear	15	12.50	40.9	3	function at level 0.05
	2	reticular	15	23.63			

clear From schedule(3) presence differences function statistically between the two groups the two trials in collection when level(0.05).

Where reach Average rank for the group Experimental first (12.50), and average rank for the group Experimental the second (23.63)

Table 4: value (U) and its significance statistic for the differences between averages sort grades students the two groups the two trials in the test sides Cognitive

Variable	the group	N	average rank	total ranks	Values U	Indication level
Collection	1	15	11.20	168.00	48	function at 0.05
	2	15	19.80	297.00		

clear From Schedule(4) the following:

comparison the group Experimental first in the group Experimental the second Where reach Average rank for the group Experimental first (11.20) and the group Experimental the second (19.80) was Values U is (48) She function when level indication (0.05) in favor of Average rank the above Which Favor the group Experimental the second in collection.

clear From Results Previous that Average rank the above he is Favor the group Experimental the second which used pattern sailing Retina.

Table 5: Indication the differences between averages sort the two groups the two trials in measurement dimensional for card note sides performance for skills Produce elements learning stereo

Variable	the group	N	average rank	value K2	degrees of freedom	Indication level
the performance	1	15	8.27	51.98	3	0.05
	2	15	22.73			

clear from schedule (5) presence differences function statistically between the two groups the two trials in performance skills Produce elements learning stereo when level (0.05).

Where reach Average rank for the group Experimental first (8.27), and average rank for the group Experimental the second (22.73).

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Table 6: value (U) and its significance statistic for the differences between averages sort grades students the two groups the two trials in performance skills Produce elements learning stereo

Variable	Binary comparisons	N	average rank	total ranks	Values U	Indication level
the performance	1	15	8.27	124.00	4	function at 0.05
	2	15	22.73	341.00		

clear From Schedule(6) the following:

comparison the group Experimental first in the group Experimental the second Where reach Average rank for the group Experimental first (8.27 and the group Experimental the second (22.73) She was Values U is (4) She function when level indication (0.05) in favor of Average rank the above Which Favor the group Experimental the second in performance skills Produce learning elements stereoscopic;

Table 7: Indication the differences between averages sort the two groups the two trials in measurement dimensional for card evaluation the product

Variable	the group	N	average rank	value K2	degrees of freedom	Indication level
Final product quality	1	15	12.80	37.2	3	0.05
	2	15	25.20			

clear From schedule(7) presence differences function statistically between the two groups the two trials in Quality evaluation the product Final when level(0.05).

Where reach Average rank for the group Experimental first(12.80), and average rank for the group Experimental the second(25.20).

Table 8: Values (U) and its significance statistic for the differences between averages sort grades students the two groups the two trials in Quality evaluation the product Final

Variable	Binary comparisons	N	average rank	total ranks	Values U	Indication level
Final product quality	1	15	11.53	173.00	53	function at 0.05
	2	15	19.47	292.00		

comparison the group Experimental first in the group Experimental the second Where reach Average rank for the group Experimental first (11.53) and the group Experimental the second (19.47) She was Values U is (53) She function when level indication (0.05) in favor of Average rank the above Which Favor the group Experimental the second in in Quality evaluation the product Final.

4. Discussion

clear From Results Previous that Average rank the above he is Favor the group Experimental the second which used pattern sailing reticular and style routing during learning and agree this is The result with consequences studies many Including: agree the study current study All From (A princess al-Mu'tasim, 2010; Abdulaziz students, 2010; Waleed Youssef, 2014; on me Mayor, 2014; Naglaa Knight, 2016; Muhammad Sobhi, 2017; halves epic, 2018)

as such Can Explanation consequences search in Light establish and assumptions theories learning Such as:

theory learning My experiences:

environments learning Triple Dimensions she environments Learn existing on me Experience, and assume this is the theory that learning proces active to create Knowledge From During formation Experience, and that People they learn in the form of better From During the work, and that learning Effective Should that attach between Knowledge acquired and its applications the operation, Entrances learning my experiences hurry learning active, and knowledge and improve sharing and teach peers, and progress opportunities more complicated for entries miscellaneous for operations learning and its outputs, focus this is the theory on me Plural between Experience and perception and knowledge and behavior in learning, Include on me four Forms She: learning tangible And the note contemplative, and perceptions

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naked, and experimentation active, and all agree with structure environments learning default Triple Dimensions (Mohammed Thursday, 2020, 69).

theory learning Situational:

describe this is the theory learning in Communities practice, and confirms on me that learning is happening in Situations certain, learning Situational Complete From During Application learning in context my position specific, And from During interaction and sharing in Communities practice, The knowledge produce From During interaction the individual with others in The environment, and requires to provide Situations and environments educational real or Similar for reality, and this is can't in Many From sometimes, and prepare environments default Triple Dimensions alternative the only And the best for environments the real (Lave & Wenger, 1991).

Conclusion

The research found the effect of the network surfing pattern on developing the skills of producing stereoscopic learning elements, as it gives freedom of movement and saves time for the learner to develop his skills in the three-dimensional learning environment, which is not available when using the linear navigation pattern.

The research recommends that those in charge of the educational process should use digital learning elements, especially stereoscopic.

Research recommendations:

In light of the findings of this research, the researcher recommends the following:

• Employing the proposed three-dimensional learning environment in the current research to train teachers on the skills of using assistive technology applications.

• Employing the proposed three-dimensional learning environment in the current research to train teachers in the skills of using assistive technology applications and serving people with special needs.

• The necessity of building codified standards when designing three-dimensional environments based on different sailing styles.

• The need to pay attention to developing the skills of producing stereoscopic learning elements among students at all educational levels.

• The need to take into consideration the educational foundations, principles and concepts associated with learning theories (cognitive, constructivist, cognitive, behavioral, and communicative) when designing three-dimensional learning environments.

• Conducting more educational studies with the aim of developing the skills of producing stereoscopic learning elements.

• Using different methods when evaluating students with 3D learning environments based on different navigation styles.

• The need to draw the attention of those in charge of preparing curricula for people with special needs, by benefiting from the results of this research.

• Awareness of those responsible for educating persons with disabilities of the educational importance of using the elements of stereoscopic learning in achieving the desired goals of educating students with hearing disabilities.

• Conducting further studies on the three-dimensional learning environments based on the interaction between navigation and guidance and their educational implications in the field of teaching and developing the skills of hearing-impaired students.

Suggested research:

In light of the findings and recommendations of the current research, the following research topics are proposed:

• Measuring the impact of a three-dimensional learning environment based on the interaction between navigation and orientation to develop reading comprehension skills for students with hearing impairments at different stages of education.

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• Studying the effect of the interaction between the level of previous cognitive experience and navigation patterns in developing the cognitive achievement and skill performance of graduate students in the production of stereoscopic learning elements.

• Studying the relationship between other navigation patterns and other cognitive methods, and linking them to the nature of the content.

• Studying the impact of the interaction between other content organization methods and measuring their effectiveness and adaptive navigation patterns.

• Studying the interaction between guidance methods and sailing patterns on the development of different thinking skills and problem-solving skills.

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