

Summary of the Study

Introduction

The studies conducted on virtual reality using in learning domain confirmed that learning in virtual reality is considered a significant process, increases student's participation and makes learning more fun. The study conducted by Karitiko, et al.(2010,P. 884) added that whenever the learner is participant , involved in task , being a way from the problems surrounding him or any object hinder his learning , this increases the motivation and fun learning

In fact, the virtual reality provides a learning environment generating computer and alternative to the actual reality that enabled the learner to be involved in it, interact with and control using external means of connecting their senses with the computer (Khamis,2003,P. 327) . It is required to be involved the existence of three-dimensional environment that we deal with in real time (Liu, 2009,P. 316).

Except that any technological advancement with its benefits and disadvantages including the virtual reality, there are some problems that hinder its use in Educational establishments that affected in their effectiveness in the learning process.

The first problems encountered by the researcher and related to the virtual reality are the confusion between the concepts in the term of electronic, and virtual, simulation and virtual reality, mixed reality, and the other thing is the physical and physiological problems that affect the individual when exposed to the virtual reality.

There are physiological problems such as foggy vision, changes in the heart and blood vessels, change in motor performance, change in cognitive control, eye strain, stomach pain, depression, hallucinations, visual disturbances, autism, disorders of the digestive system, disorientation, unsteadiness, disorder in the machine respiratory, stress, addiction(Nichols & Patel, 2002, pp. 252-253)

The financial problems related to the high cost of hardware and the requirements of the design of virtual environments, for example, the material cost of the helmet and provides only a single user, however the use of the cave system reduces the defects of the helmet, but it needs to have large areas to get a good view, as it is difficult to transfer from one place to another because of its

size and the accurate settings required. It is also costly because of the devices used and the cost of maintenance (Pougnadoresse, Bouvier, & Biri, 2009).

Although the previous studies surveyed these problems, studies such as (Ling, Brinkman, Nefs, Qu, & Heynderickx, 2011) and Butavicius, Vozzo, Braithwaite, & Galanis (2012) clarified that there are no symptoms as a result of virtual reality exposure through using Simulator Sickness Questionnaire (SSQ).

Some studies relates the reasons of appearing the pathological symptoms related to virtual reality exposure to some of factors such as head and body movement , updating data rate , exposure time , and exposure repetition such as the Walker (2008)'s study . Also gender can affect as a static variable in the severity of pathological symptoms. The results of Kaufmann , Kozeny , Schaller , Brown and Hitz (2012) clarified appearing symptoms of visual fatigue problem for females than in males, also the field of vision has an impact on the appearance of symptoms of the disease where the results of that study clarified that the broad field vision is working to increase the severity of symptoms more than a narrow field of vision

There are some factors should take into consideration when using virtual reality such as the timing factor or exposure period , where Biernacki & Dziuda (2014) clarified that the pathological symptoms related to Cybersickness appeared after two minutes and continued for thirty minutes especially the symptoms related to visual stress. Other symptoms are appeared such as seasick and confusion. This result is supported by a study conducted by Dziuda, Biernacki, Baran, & Truszczynski, (2014) . They clarified that time is an effective factor in appearing the symptoms with the movement in virtual scene. These symptoms can be continued for short period especially for confusion and visual stress. Repeating virtual reality exposure is another factor which caused some sort of adaption to be happened. In their study , Vinson, Lapointe, Parush, & Roberts (2012) referred to the exposure for a long time leads to increasing sensory conflict and physiological problems, and repeated sessions leads to adapt to the sensory conflict.

Previously, it can be identified the multiplicity of factors and different studies in the reduction of ways, and different for the length of time related to exposure for reducing symptoms as well as the frequency of exposure to the virtual reality and its impact on the severity of Cybersickness symptoms. Thus, Nichols & Patel (2002 , PP. 268-269) recommended further experimental

studies dealing with the negative effects of virtual reality , in order to reach for the instructions that achieve benefit of virtual reality system, and reduce negative symptoms resulting from exposure to the virtual environment.

The problem of the Research and Questions

Previous studies and research have shown, the researcher dealing with education technology field , that there are multiple problems impeding the activation of virtual reality systems in the educational process and affect its effectiveness, some of which related to funding that is linked to the material cost for the purchase virtual reality hardware and software design and maintenance, and some special training deficient in preparing of educational software designers and education technology specialist and software engineers, and lack of training design teams organization of engineers and designers at centers of educational software system, others physiological , psychological and social impact associated with participant and the effect of virtual reality technology.

As confirmed by the pilot study conducted by a researcher at undecided on the three-dimensional cinema, and their owners, they signaled to the high of the system and software required by the cost, as well as physiological problems

Because of the importance of this educational technology, the researcher is trying to monitor these issues and search for a series of solutions to take advantage of the proceeds of this technology on education, and to clarify the effect of applying it to the Education Technology students to increase their achievement, develop their skills and reduce the severity of pathological symptoms that may arise as a result of exposure to the virtual reality .

Therefore, the problem of the study can be clarified in the following main question :

What is the suggested model for solving virtual reality problems in the light of educational technology advancements?

This question can be answered through answering the following questions:-

- What are virtual reality problems according to the experts and users views?
- What are the standards of constructing virtual reality software?
- What is the suggested model for reducing some virtual reality problems?

- What is the effect of the different students' exposure to the virtual reality on the appearance of the pathological symptoms related to Cybersickness ?
- What is the effect of repeating virtual reality exposure on appearing pathological symptoms related to Cybersickness ?
- what is the effect of the suggested model for reducing some virtual reality problems on the Educational technology students ' cognitive aspects achievement and acquiring the performance aspects for portable computer maintenance skills?

Purposes of The Research

The present study aims at solving some problems related to using and employing virtual reality in education through identifying the following aims:-

- Identifying problems of virtual reality and the present research tries to solve them.
- Providing design and construction of virtual reality software systems standards in light of technological innovations.
- Constructing a model achieves most of the characteristics of virtual reality software and at the same time tries to address some problems in the light of technological innovations.
- Obtaining the optimal duration of exposure to the virtual reality without the appearance of physiological problems for the user affect the achievement of learning outcomes.
- Making sure of the impact of repeated exposure to the virtual reality to reduce the severity of symptoms resulting from exposure to the virtual reality.
- Experimenting the proposed system that is based on problems reduction model and confirmed its effectiveness in increasing achievement and developing portable computer maintenance skills for students at Education Technology department.

Significance of The Research

- Solving problems that limit and hinder the achievement of the goals to take advantage of virtual reality technology in the educational process and to achieve the best return for learning outcomes.

- Taking advantage of this technology and its characteristics in the educational process in order to achieve the best return on educational outcomes, and overcome the difficulties of providing direct experiences of the forms of learning.
- Matching the recent technological progress that related to the virtual reality and neglected in the Egypt and Arab world.
- Drawing the decision makers and officials' attention and those in charge of educational institutions to manage the most important problems that hinder the application of virtual reality technology, and problems caused by its use and then take the procedures and mechanisms to solve them.
- Focusing on the most important reasons for non-proliferation of virtual reality technology in schools and the Egyptian universities, where it was known to the researcher there is scarcity in laboratories virtual devices in Egypt, In Alexandria library There is (CAVE) Full and is called (VISTA) - In exploratory Center for Science Technology in Hadaaq El-Qouba there are helmets of (5dt HMD) type and data gloves (Data Glove) and view a 360 degree panorama - in faculty of Engineering and Information in Cairo there are helmets and data gloves and some researchers in the field of educational technology bought virtual reality devices as a research requirement.

Delimitations of The Research

- **Human Delimitations:** The society of the research is fourth year students enrolled in educational technology department. The sample is from males because the application was outside the college in three dimensional cinema and it is difficult to obtain a sample of females.
- **Topic Delimitations:** the skills of decoding and installing RAM and hard drive are identified as skills from portable computer maintenance skills according to jury's. As the researcher physiological problems, and financial (use the Wii as an alternative to the data glove)
- **Spatial Delimitations:** the research is limited to three dimensional cinema where it is spread out in the Egyptian society , As a virtual reality System, called Power Wall (see VR systems in the theoretical framework of the research)
- **Time Delimitations:** In the academic year 2014/2015

Sample of The Research

The sample of the study is consisted of (45) fourth year students enrolled in educational technology department. The researcher explained the aim of the research, the procedures of the application process and the effects of virtual reality exposure . At the beginning, the SSQ was applied to identify Cybersickness problems. The researcher observed that all participants' response were (there is no symptoms) except one student had headache symptoms thus he is eliminated. There were two visually impaired students were eliminated also, and two students were absent during application. Thus, the sample of the study became (40) male students. All the sample were males as it transmitted to the three dimensional cinema, the females refused participating. Thus, the sample was divided into two groups as follows:-

- The first experimental group that exposed to the virtual reality for (20) minutes continuing in the session consisted of twenty students. The sample selected randomly.
- The second experimental group that exposed to the virtual reality for (10) minutes continuing in the session consisted of twenty students.

Instruments of The Research

Construction Instruments

- A list of virtual reality problems.
- A list of virtual reality system design and construction standards.
- The suggested model for reducing some virtual reality problems.
- Virtual reality software exposed in three dimensional cinema. It is a low level system.

Measurement Instruments

- An achievement test to measure the cognitive aspects of the skills student acquires from the suggested model application.
- An observation checklist for the psychomotor aspect of the skills student acquires from the suggested model application.
- Simulator Sickness Questionnaire (SSQ) (Kennedy).

The Method, variables and experimental design of the Research

- This research is related to Quais-experimental research that identified the effect of the independent variable on some dependent variables. The study is dependent of the descriptive analytical method in preparing the theoretical background of the research and previous studies analysis.

Variables of the Research

- The Independent Variable: Virtual reality program depend on The suggested model, virtual reality exposure time and repeating exposure.
- The Dependent Variables: the side effects of virtual reality exposure, The cognitive achievement for the portable computer skills and the practical performance of the portable computer skills.

The Experimental Design : It contains two groups :

- The first group that exposed to the virtual reality for two sessions each session (20) minutes.
- The second group that exposed to the virtual reality for four sessions (4) sessions each session is (10) minutes.

The experiment is conducted twice with a week chronological break. The experiment is represented in measuring what the students obtains of skills and skills related to portable computer maintenance and identify the pathological symptoms related to Cybersickness before applying the program then applying the program to both groups. The first group exposed for (10) minutes then took a break where the SSQ applied then complete the exposure to the virtual reality for another 10 minutes then the instruments of the study are applied , the experiment is repeated after a week without applying the test and the observation checklist.

Procedures of the Research

To achieve the specific objectives of the study , answer the questions of the study , the researcher followed the steps and procedures as follow:-

First : The Theoretical Aspect: Reviewing literature and previous studies :-

- The virtual reality technology and its importance to the learning process.

- The virtual reality software design benefits, characteristics and standards.
- The virtual reality software designing models.
- The virtual reality problems.
- Educational technology advancements related to the virtual reality.

Secondly: The Practical Aspect

- Preparing a list of virtual reality problems in the light of previous studies and judged it by experts in the field and reached the final list after modification, delete and addition.
- Preparing a list of virtual reality software design and construction and judged it by experts in the field and identify the final list after modification, delete and addition.
- Conducting the proposed model to reduce the virtual reality problems in the light of technological advancements that achieve the virtual reality benefits.
- Preparing a list of skills required for educational technology specialists and related to portable computer maintenance and judged it to identify the sub-skills in the virtual reality system.
- Translate Simulator Sickness Questionnaire (SSQ) (Kennedy) and measure the validity and reliability of the instruments of the study with the use of statistical treatments
- Preparing the achievement test to measure the cognitive aspect of portable computer maintenance according to the list identified previously and judged it .
- Preparing the observation checklist to measure the psychomotor aspect performance for the portable computer maintenance and judging it.
- Conducting the pilot study to measure the validity and reliability of the instruments of the study with the use of statistical treatments to be valid for application.
- Identifying the sample of the study.
- Conducting the test, the observation checklist and SSQ to the study sample before the experiment to identify the equivalence of the groups and there aren't any pathological symptoms among participants.

- Conducting the main experiment to the study groups where the first group exposed (20) minutes and taught the whole content , the second group taught the content on two session , each one (10) minutes and there is a break (10) minutes where the SSQ was applied.
- Applying the test, the observation checklist and SSQ after the experiment to the study sample.
- Repeating the experiment represented in procedure (9,10,11) again after week without applying the test or the observation checklist to measure the return of virtual reality exposure repetition.
- Answering the questions of the study and explain
- Recommendations and suggestions according to the results of the study.

Results of the Research

The results of the study are clarified through answering the questions of the research :-

To answer the first question: what are virtual reality problems according to the experts and users views?

- The researcher prepared a list of virtual reality problems and submitted it to jury members of educational technology experts and specialized and educational software designed to judge it , applied it to experts in the specialization – programmers and users to identify their opinions of the most important problems that hindered virtual reality technology application in Egypt. He obtained that the most important problems are financial problems and problems related to the virtual reality systems devices. The researcher also identified that there is a lack among educational technology specialists and the educational software designers in their preparation and the courses related to design and produce three dimensional objects and virtual reality software. The researcher also identified the physiological problems that the user exposed to in virtual reality software exposure, as it clarified in chapter one.

To answer the second question: what are the standards of constructing virtual reality software?

- The researcher analyzed the studies and previous research related to virtual reality technology and reviewed the international specialized

institutions editions to prepare a list of designing and producing virtual reality software standards. The list was constructed according to the procedures clarified in chapter four. The list was submitted to jury members to judge it and obtained the final list which consisted of two domains. The first domain: the psychological and educational characteristics, it consisted of (6) standards and (43) indicators. The second domain: the technical characteristics that consisted of (5) standards, (46) indicators. Thus, the total of indicators is (89).

To answer the third question: what is the suggested model for reducing some virtual reality problems?

- After reviewing virtual reality software design models as they clarified in the theoretical background, he model of reducing side effects of virtual reality exposure, and multimedia software, e-learning and blended learning design models, the researcher identified the model related to constructing virtual reality software and reducing its problems .The model is submitted to educational technology specialists to judge it until it reached its final form in chapter four. Then the procedures of the study are clarified according to this model.

To answer the fourth question: what is the effect of the different students' exposure to the virtual reality on the appearance of the pathological symptoms related to Cybersickness ?

The First and second hypotheses are confirmed to answer this question as follows:-

- There is a statistically significant difference (at 0.01 level) between the mean score of the first experimental group which exposed (20) minutes in the virtual reality and the second experimental group which exposed (10) minutes in the SSQ questionnaire, where the second experimental group less than in exposing to the pathological symptoms to Cybersickness even after repeating the experiment.
- There is a statistically significant difference (at 0.01 level) between the mean score of the first experimental group which exposed (20) minutes in the virtual reality and the second experimental group which exposed (10) minutes in the SSQ questionnaire, after repeating the application of the program where the second experimental group less than in exposing to the pathological symptoms to Cypersickness even after repeating the experiment.

To answer the fifth question: what is the effect of repeating virtual reality exposure on appearing pathological symptoms related to Cybersickness ?

The third and fourth hypotheses are confirmed to answer this question as follows:-

- There is a statistically significant difference (at 0.01 level) between the mean score of the post administration and repeating application of the program to the first experimental group which exposed (20) minutes in the virtual reality in the SSQ questionnaire, where with the repeated exposure to the virtual reality leads to decreasing the pathological symptoms.
- There is a statistically significant difference (at 0.01 level) between the mean score of the second experimental group who exposed (10 minutes) during and after the first experiment, during and after repeating the experiment in SSQ, since it after the third repetition of exposure to the virtual reality the severity of the symptoms reduced significantly even come close to that go away.

To answer the sixth question: what is the effect of the suggested model for reducing some virtual reality problems on the Educational technology students ' cognitive aspects achievement and acquiring the performance aspects for portable computer maintenance skills?

- The essential maintenance skills are identified through reviewing books and specialized reference in portable computer" laptop" maintenance. The list of the skills is submitted to jury members to verify its importance and relevance to the general aim of the present research. The researcher asked the jury members to identify the most important skills through which the suggested program is designed in order to represent all the skills where they are required an integrated team work. Therefore, the skills of decoding and installing RAM and hard drive are identified as they are represented in the virtual environment.
- A virtual reality program is designed for acquiring students at Educational Technology department skills of decoding and installing RAM and hard drive for the portable computer" laptop" according to the proposed model, so as to build an integrated system that can solve some of the problems that may appear in evaluation stage. The program was built according to the procedures of the proposed model and according to the scenario set by the researcher. The program was submitted to jury members to provide

their opinions and comments on the design. Then the program was modified and become ready for display inside the three-dimensional cinema to present in front of the study sample.

The First, fifth and sixth hypotheses are confirmed to answer this question as follows:-

- There is a statistically significant difference (at 0.01 level) between the mean score of the pre and post administration for the first experimental group which exposed (20) minutes to the virtual reality in the achievement test and the observation checklist in favor of post administration.
- There is a statistically significant difference (at 0.01 level) between the mean score of the pre and post administration for the second experimental group which exposed (10) minutes then (10) minutes –(20) minutes to the virtual reality in the achievement test and the observation checklist in favor of post administration.
- There is no a statistically significant difference (at 0.01 level) between the mean score of the first experimental group which exposed (20) minutes in the virtual reality and the second experimental group which exposed (10) minutes in the post administration for the achievement test and the observation checklist.

Recommendations of the Research

In the light of previous results, the following recommendations could be presented:

- Adopting a list of criteria that have been proposed at the virtual reality software design.
- The educational and instructional institutions in Egypt should construct low cost virtual reality systems to benefit from this technology in the development of skills and learner's experience that is close to direct experience.
- Developing faculties of Education and Specific Education regulations especially the Educational Technology Departments to include three-dimensional graphics and virtual reality software design courses, as well as Faculties of Engineering and computing and information.

- There is a need to develop professional competence for Educational Technology specialists, in light of the educational technology innovations and the courses development in the light of it.
- Benefiting from the idea of three-dimensional cinema in constructing low cost systems in the schools and universities.
- Conducting further studies to benefit from the Wii remote as a sensor of movement.
- Benefiting from the instruments of the study for measuring the related variables in other research, as well as take advantage of the suggested program to train students enrolled in Educational Technology Department on maintenance skills.
- Taking into consideration virtual reality application guidelines in designing learning environments to reduce the pathological symptoms related to Cybersickness .

Further Suggested Research

In the light of the variables of the study, previous studies analysis and results of the study, the following implications for further research were suggested:-

- Studying the effectiveness of Augmented Reality and its effect on achievement and skills acquisition in the learning process, increasing attitude and developing different types of thinking.
- Studying the side effects of high level or involved virtual reality exposure.
- Studying the effect of the degree user presence in the virtual reality environments on the specific symptoms of Cybersickness .
- Studying the effect of vision on degree presence and involvement of virtual reality and the side effects of virtual reality exposure.
- Analyzing the studies and research related to the virtual reality in Arab World for investigating the percent of prevalence of these studies.
- Conducting a comparative study of different virtual reality systems on the same of virtual environment and its effect on degree of presence and prevalence and the high degree of side effects.
- Constructing low cost virtual reality systems.