

A Design of Computer Generated Environment for Learning Among Agriculture Students at the University of Ilorin, Ilorin, Nigeria

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ABSTRACT

Abstract- This study examined how a computer generated environment using the non-immersive Virtual Reality can enhance and improve student learning, especially in courses that involves practical. Using the agriculture students at University of Ilorin as a case study, the students' faces some challenges like lack of resources to enable them carry out their farming activities as expected on the farmland due to insufficient resources and farmland. The study therefore, has been able to improve the students' practical wise by designing a computer generated environment using Virtual Reality to learn the planting of maize. The study uses the stratified sampling method to survey a total number of 50 students in the agriculture department at University of Ilorin and the result showed that the computer generated design for learning maize planting has a significant effect on the students.

Keywords: Computer Generated Environment, Non-immersive, Virtual Reality, 3D and Maize Planting

Aims Research Journal Reference Format:

S.O. Sulyman-Haroon (2018): A Design of Computer Generated Environment for Learning Among Agriculture Students at the University of Ilorin, Ilorin, Nigeria. Advances in Multidisciplinary & Scientific Research Journal. Vol. 4. No.2, Pp1-8

1. INTRODUCTION

Computer generated environment is a 3-Dimesnsional (3D) interactive environment, made up of the x, y and z axis view which is quite different from normal x and y or 2-dimensional computer environment. The computer generated environment are replica of the real environment which allow users experiments in a simulated environment (Gentry, 2016). Moreover, with Virtual Reality (VR), computer generated environment has gain lots of popularity in education and other various fields as it has the ability to provide real time responses, interaction and imagination making the user feels the real-world presence (Lee, Wong & Fung, 2010). However, VR systems nowadays can run on a personal or desktop computer where users can interact with the computer generated environment or virtual world using some computer gadgets like the mouse, keyboard and touch screen to get instance feedback and simulation, such VR are known as the Desktop or Non-immersive VR (Lee et al., 2010). In addition, Virtual Reality (VR) is a simulated information environment which is being used to create experiences that resemble a real life situation using a computer so as to create a computer generated environment. Apart from VR usage in education, it can also be used in fields such as industrial, engineering design and surgery to carry out procedures which seem difficult, time consuming, complex and expensive; and as such has provide solutions to lots of problems (Górski, Buń, Wichniarek, Zawadzki & Hamrol, 2017).

However, despite the unexceptional usage of VR (Kuliga, Thrash, Dalton & Hoelscher, 2015; Valmaggia, Latif, Kempton & Rus-Calafell, 2016; Potkonjak, Gardner, Callaghan, Mattila, Guetl, Petrović & Jovanović, 2016) there is dearth of research on its application in the field of agriculture. Some of the tertiary institution nowadays lacks sufficient farmland that will enable students carry out their farming activities. This study therefore takes a different stand by designing a computer generated environment using the non-immersive VR among some undergraduate agriculture students in University of Ilorin, Ilorin, Nigeria. The study would be of high importance as it tends to help in solving some of the challenges faced by the students in carrying out their farming activites as required and improve the practical assessment of the students; by determining the appropriate elements of VR for the maize planting in a virtual world. This study would create answers to questions on; how can the agriculture science, precisely maize planting course content be complemented using the computer generated Virtual Reality? And how can agriculture planting be carried out using the computer generated VR? It is thereby expected that the outcome of the study will determine the appropriate elements of VR to design the maize planting module, design the computer generated VR maize planting and evaluate the usability of VR.

2. LITERATURE REVIEW

2.1 Virtual Reality (VR)

Virtual Reality (VR) also called Virtual Environment (VE) is described as the technology that allows a computer simulation interaction between the computer and the users (Mazuryk & Gervautz, 1996). It has also been defined as the using of interactive simulations to provide users with an opportunity that makes them engage in a computer generated environment that is similar to the real-world (Sangani, Weiss, Kizony, Koenig, Levin & Fung, 2012)

2.2 Categories of Virtual Reality

The VR/VE systems can be classified into three (3) main categories; they include the non-immersive, semi-immersive and fully immersive VR (Van Wyk & Villiers, 2009).

- **Non-immersive VR:** This is also known as a Desktop VR. The non-immersive/Desktop VR involves when users can interact with the virtual environment through some hardware devices like the keyboard and mouse; it provides nearly no sense of immersion for the users making it look so similar to the normal 2D computer screen.
- **Semi-immersive VR:** In this type of VR system, Users can interact with the 3D environment, but they can still feel and look at the real world around them, making them partially immersed in the environment. The sense of interaction between the user and the 3D environment can be a computer screen or some other larger wall sized screen.
- **Fully immersive:** In this VR environment, the user is fully immersed in the virtual world with no interaction with the real world around them. The user can use gadgets like, the Head Mounted Display (HMD) and cyber gloves so as to make them fully immersed in the 3D environment. Another type of the fully-immersive VR is called CAVE; it allows multiple projectors to be mounted with various configurations (Celicil et al., 2013).

2.3 Multimedia Elements for Computer Generated Virtual Reality Design

In designing the VR for maize planting, there are some essential multimedia elements that are required in order to make it simulative, interactive, imaginative, educative and entertaining. These elements are explained in the table below (Liou, Yang, Chen & Tarng, 2017; Schrader, Pomona, Young, Sulzen, Holcomb, Lee & Scheffler, 2017)

Table 1: Multimedia Elements

Multimedia Elements	Explanation
Visual	This is made up of: graphics, images, texts, real object, simulations and animations
Images	These consist of photos, which are needed in certain areas of the design
Graphics	This represents the graphical designs usually made up with special characteristics
Real objects	These are the object of real life that will be needed to add life to the classroom. Objects such as; computer and projector
Audio	This is made up of the audio effects used in the design, such as narration about the design
Animations	This is one main component in multimedia elements. It involves the understanding of some complex and abstract idea.
Simulations	This is the imitation of the real-life situation. It will allow users to interact with the virtual world, by allowing them (users/students) to view unreal objects in a virtual environment

2.4 Multimedia Theory

There are various theories in the educational environment, but the multimedia theory is chosen in this study because of its involvement in different forms of media; such as text, images, sound and animations. (Mayer, 2005) carried out a research on the Cognitive Theory of Multimedia Learning framework, the framework is important in education and it focuses on the visual and auditory channel for multimedia or computer generated design. The theory is important in educational design and as such will be used in this study for the design of the computer generated environment.

The framework is shown in the figure below:

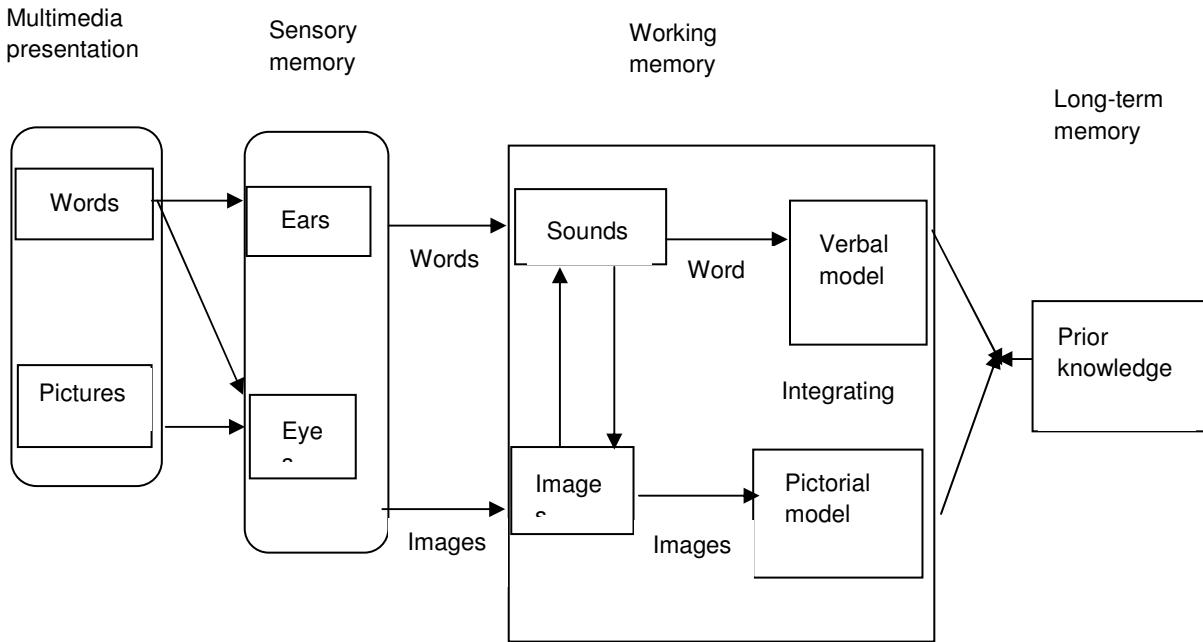


Figure 1: Framework for Cognitive Theory of Multimedia Learning

The framework of the cognitive theory of multimedia learning above depicts five cognitive processes. They are explained in the table below (Mayer & Alexander, 2011).

Table 2: The five cognitive processes involved in the Cognitive theory of multimedia learning

Process	Description
Selecting words	This triggers relevant words in the working memory of the multimedia presentation to create sounds
Selecting images	This triggers relevant pictures in the working memory of the multimedia presentation to create images
Organizing words	This allows to create a coherent verbal model in the working memory among selected words
Organizing images	This allows to create a coherent pictorial model in the working memory among selected images
Integrating	This is the connection involve between the verbal, pictorial models and the prior knowledge.

2.5 Design of VR maize planting

In order to answer the research questions stated earlier, the computer generated non-immersive VR for learning maize planting was designed. The design is made up of images and audio. It is as shown in the figures below:

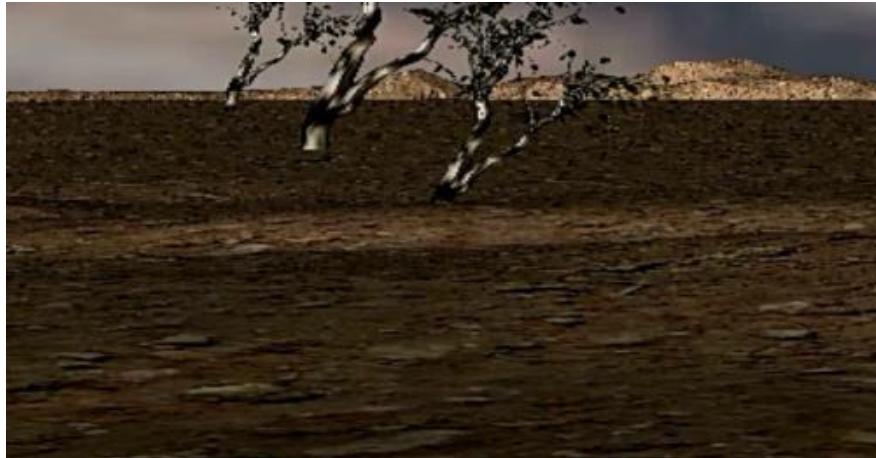


Figure 2: Screen shot of the farmland in the maize planting prototype



Figure 3: Screen shot of the seedling stage in the maize planting prototype

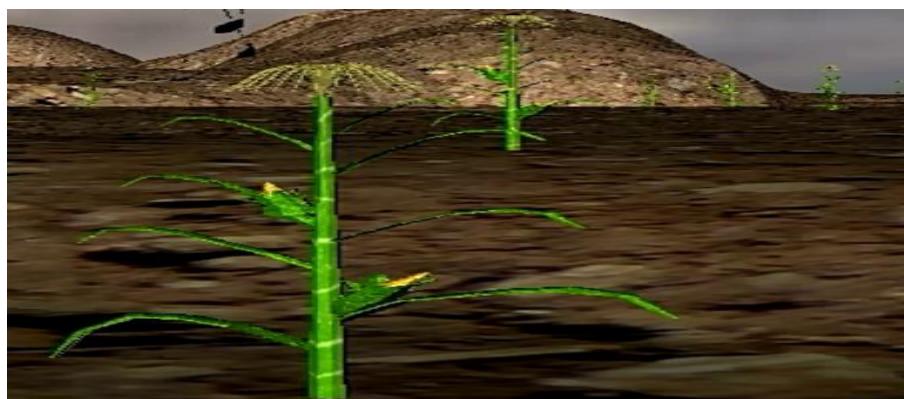


Figure 4: Screen shot of the maize germination stage

3. METHODOLOGY

The general methodology adopted from Vaishnavi & Kuechler, 2017 was used in this research work. The phases included in the methodology are; Awareness of problem, suggestion, development, evaluation and conclusion. The study was carried out among the undergraduate students at the agriculture department, University of Ilorin. It makes use of the quantitative research analysis and handed out 50 questionnaires to the students, while 31 of them returned it. The questions that were asked the students were based on user experience with computer, experience with VR and experience with using the designed VR. The questionnaire designed and the prototype packaged in a CD-ROM was distributed to the student. They make use of the distributed prototype in answering some of the questions. Afterwards, the SPSS (Statistical Package for Social Sciences) was used to analyze the data and the descriptive statistics analyzed.

Table 3: Descriptive Analysis

Items	N	Mean	Std. Deviation
1. Learning through the maize VR enhance my learning efficiency	31	4.2258	.66881
2. Learning through the maize VR improve my remembering skill	31	4.0000	.57735
3. Learning through the maize VR enhance my learning performance	31	4.1613	.68784
4. The maize VR environment provides a complete learning information	31	3.9032	.70023
5. The maize VR environment provides information that is easy to comprehend	31	4.2581	.68155

Experience with the prototype

Based on the descriptive analysis as shown table 3 above, this section will describe the experience of the respondent's to the designed prototype.

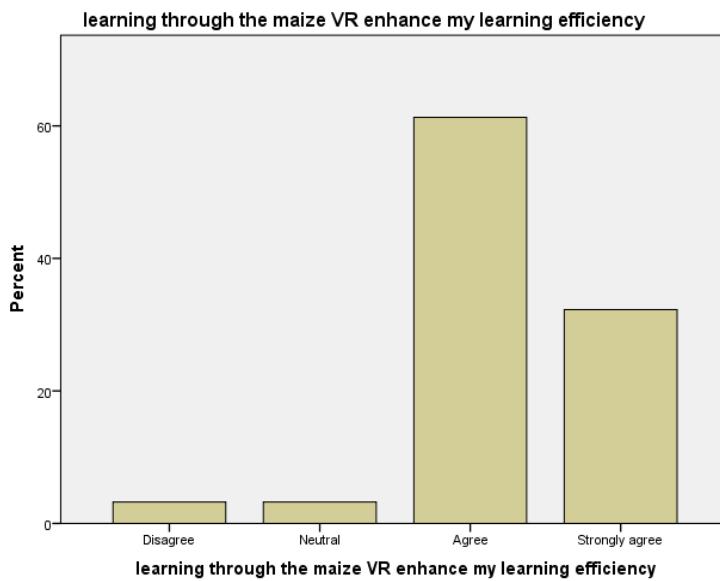


Figure 5: Learning through the maize VR enhanced my learning efficiency

In the respondent's experience with VR prototype, 61.3% of the respondents agreed that the prototype enhanced their learning efficiency (Refer 5 above).

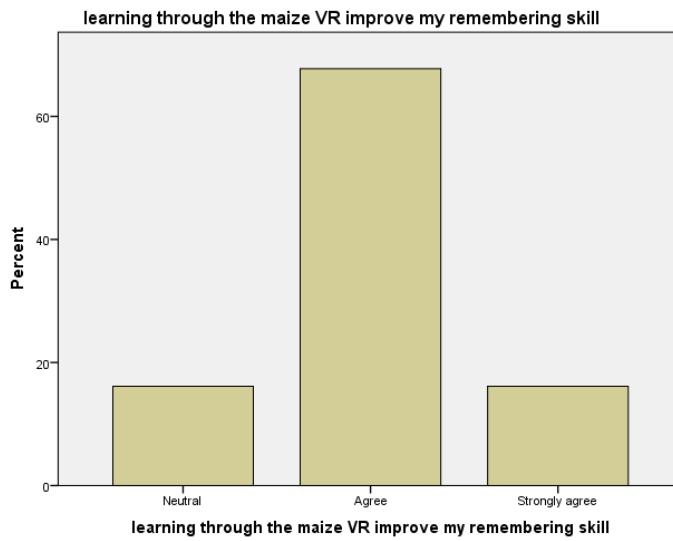


Figure 6: Learning through the maize VR improved my remembering skill

Figure 6 show that 67.7% of the respondents agreed that the prototype improved their remembering skill.

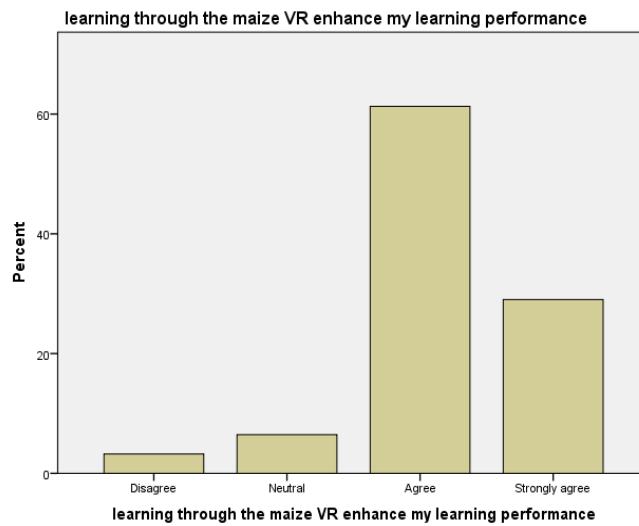


Figure 7: Learning through the maize VR enhanced my learning performance

The figure 7 and 8 respectively, illustrates that 61.3% of the respondents agreed that the prototype enhanced their learning performance and provided them with a complete learning information.

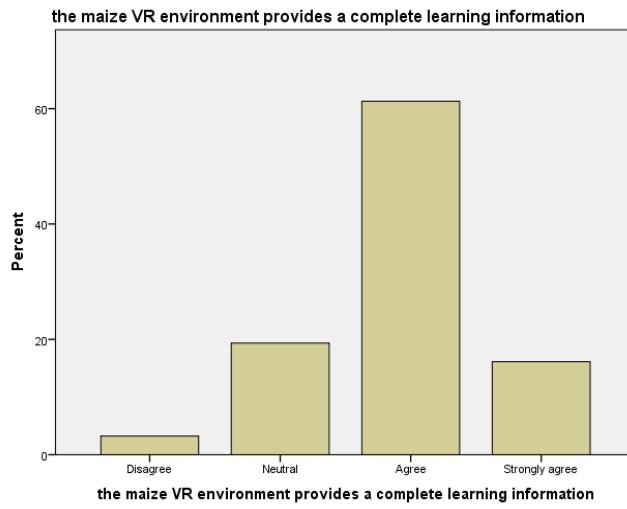


Figure 8: Learning through the maize VR provided complete learning information

And then finally, figure 9 shows that 48.4% of the respondents agreed that the information on the prototype was easy to comprehend.

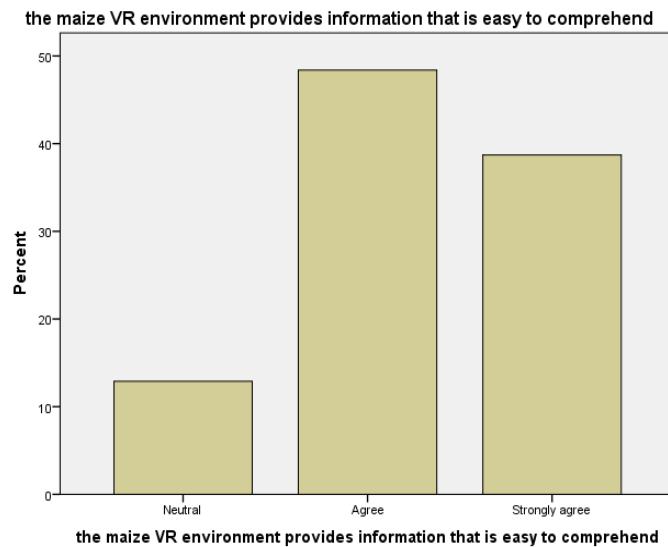


Figure 9: Learning through the maize VR provided information that was easy to comprehend

Based on the results of the descriptive analysis shown above, it was concluded that the VR maize planting prototype greatly affects the assessment of the respondents (students). This, therefore, brings about the conclusion that the VR maize planting prototype was easy to understand by the students and has provided them with a new learning style in learning maize planting. It also gave the students a new experience in exploring the virtual world and helped them in learning the maize planting practical.

4. FINDINGS

From the results above, it was shown and concluded that the use of the VR for learning maize planting greatly affects the assessment of the students (the respondents); by providing a new experience into the students learning style and also helped them to learn the maize planting practices. This study is in line with the usability of multimedia elements to serve as learning strategies (Tosho, Abdul Mutualib & Nur Abdul Salam, 2014)

5. DISCUSSION AND CONCLUSION

In conclusion, this research work was able to design a prototype that will assist students in learning maize planting, and this was achieved by designing a computer generated non-immersive Virtual Reality for learning maize planting in order to assist the students in their learning maize planting process. According to the analysis result, it was found that the use of the VR maize planting has enhanced the student learning process and provided them with a new learning style in learning maize planting.

Therefore, it is concluded that there is a positive effect on the usage of the VR design amongst the students.

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