Development of Wimba 3 Dimension Interactive Animation Media on Plant Anatomy

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Abstract; The purpose of this research is to develop an interactive animated 3D media using Wimba. This interactive animation created media to facilitate student understanding about the structure and function of cells and tissues in plants through the 3D medium to increase the ability of spatial and high order thinking skills. The media is created using the Blender game engine. The method used is the software development life cycle or classic method can be called also waterfall. Research procedures, namely analysis, design, coding, and tests. Tests conducted several test stages, blackbox, test validation expert lecturers and student response. The result is a decent software has to be used, the appropriateness of materials, materials have represented cells and tissues of plants, precision 3D images, the shape of the cell has a precision and detail and aesthetics of software is already good.

Keywords: Wimba; 3D interactive animation media; Plant anatomy.

1. Introduction

Spatial ability and high order thinking skills are already a requirement in any learning. Spatial thinking is a great form of human cognition [1]. Spatial thinking is a set of cognitive skills – skills, i.e. made up of a combined three elements, namely the concept of spatial, representation, and reasoning processes [2]. Spatial thinking ability can help someone to be able to solve problems in everyday life [3]. Hots are the core skills of the 21st century needs to be developed on everyone [4]. The material field of biology is largely involves spatial imagination, such as the material of the anatomy, Physiology, histology, ecology and morphology. A learning model that is appropriate for it is a model of learning which involves visual and spatial or called visuo spatial in this case is a learning model of Wimba [5]. This demands a learning model college students to perform observation, to draw and represent the results of his observations in the form of 2D and 3D. The results will make it easier for students to remember and understand the material so as to reduce the cognitive load of students. The possibility of students having difficulty in the internal representation of the 3D form or indeed the student have low spatial ability [4]. Therefore, to improve the skills of students required special software needed in the study of biology, both in high school and in higher education. For such purposes it made software for learning model called Wimba software 3dimensi-wimba, which abbreviated 3D-wimba.

Hsiung and Lai stated that students who received lessons with 3D courseware can beat the other three methods in learning outcomes. Courseware developed for such research can improve learning outcomes and lower cognitive load [6]. Palmer stated that there were seven aspects to improve child,

namely: freedom of the HOTs, build, explore, collaborate, artistic, experiment, fail, and learn on while playing [4]. Aspects of this freedom facilitates the development of evaluation, analysis, and the creation time of the students played the game. A good game is a powerful intervention which can facilitate the development of higher-order thinking skills. From the results of previous research suggests that to improve one's ability of development required HOTs spatial equipped 3D software applications that meet the seven aspects.

Before making the plant Anatomy software, students need to understand in advance how the shape and structure of the tissue itself. to form a 3D model can be made more easily and requires no special skills, but it is necessary and pertinent to possess a good knowledge of the morphological structures of the organisms in question, good quality 2D illustrations and an in-depth knowledge of the 3D development tools [7].

Interactive 3D media Wimba developed using Blender 3D software because of the nature of open-source cross-platform 3D application. Blender is a powerful and resourceful free open-source 3D content creation suite for 3D modeling, animation, rendering, and gaming that provides a complete workbench for producing still images, simple animations or very complex scenes with thousands of objects in motion, all lighted, textured and filmed for the proper view, and also used extensively in the 3D modeling community [8] [9] [10].

The purpose of this research is to develop an interactive animated 3D media Wimba software to the study of plants anatomy, under the name 3D Wimba, a media interactive animations that can be used to study the form and structure of plant anatomy tissue in 3D.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

2. Research Method

This section presents the proposed research method.

2.1. The method of software development

Methods of software development is waterfall or life cycle classic method [11]. Research procedures included from the stage of planning, modeling, construction, delivery of the system and the user, terminated with the support and software development for the next stage. The following are some testing methods:

a. Test of the functionality of the software: Black-box Methods done to find errors in the category of functions is not correct or missing, error interface, errors in data structures, as well as initial and terminal error, [12]
b. Software validation: Software validation is done to determine the feasibility of the software before use. Validation is done by giving a questionnaire to expert validation (expert judgments)
c. Product Trial: Product trials are conducted to find out the students' responses about the products that have been developed. Products will be shown by students, then given a questionnaire containing student responses.

2.2. Data Analysis Methods

Data analysis in this study uses a Likert scale, a Likert-type scale consists of a series of declarative statements. The subject is asked to indicate whether he agrees or disagrees with each statement [13]. Likert Scale is used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena through a Likert scale, the variables to be measured are translated into variable indicators. Then the indicator is used as a reference for preparing instrument items that can be in the form of questions or statements.

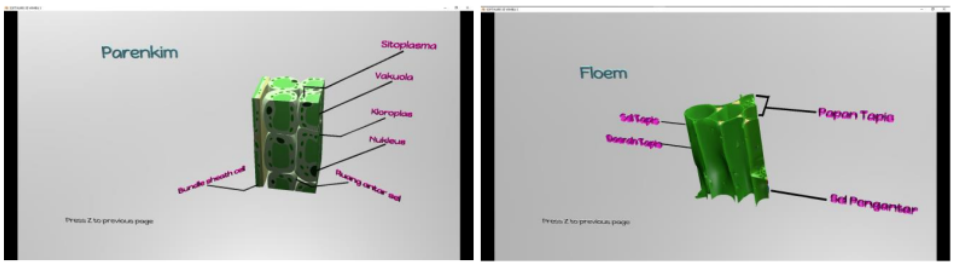
2.3 Questionnaire Analysis Validation of Experts, Responses of Students and Teachers
After the data is obtained, the next is to analyze the data. Data were analyzed with a percentage descriptive system.

3. Result and Discussion

Figure 1 and 2 depicts the developed interactive animated 3D media using Wimba.

a b

Figure 1. Opening menu form (a) and layout menu (b) of 3D Wimba



a b

Figure 2. Result 3D Interactive Animation Menu of Parenchym Tissue (a) and Floem (b) in Wimba 3D Software

The results of the study showed that after improvements were made based on suggestions from the validator and 3D Wimba interaction media software, the media was suitable for use. Blender is also widely used for making other software for a number of biomedical applications, including the integration of another neuron visualization tool called Py3DN, and other application called Neuromorph [10]. The use of the software can also be applied in the analysis and visualization of gastropods shell [14].

3.1. Product Validation (3D Wimba software)
3.1.1 Expert validation
The software has been validated by 3 expert validators, there are some inputs that can be referenced for improvement. The opinion of the validator is summarized as follows:

a. Wimba software, is quite feasible to be used as a 3D learning media for a network, but the file size is still too large.
b. Teaching materials in the Wimba1 software, simply represent the topic of plant tissue (basic tissue, vascular tissue and protective tissue). However, for the protective tissue, there has not been any discussion regarding periderm.
c. Wimba1 software is suitable for education in tertiary institutions and can improve full understanding of plant tissue.

d. Wimba 3D software is valuable for students in developing students' HOT's ability. If HOTS is used is taxonomy bloom C4 - C6, this software has greatly facilitated students in C6 cognition, especially in creating 3D models independently.
e. The complexity of the label in the 3D model is enough to represent the characteristics of students at the college level and have shown precise 3D images and have provided clear information.
f. Wimba software, has aesthetic value, treats the color of plant tissue, audio and toolbar display can already make it easier for users to operate this software

Input from validator, processed and made improvements. As for the improvements made are as follows: 1. the size of the file is minimized, 2. the improvement of labels and images, 3. improvements to the software to stimulate the ability of 3D representation to be done by adding pain devices, 3. done repairing the labeling of cell space in transverse incisions, repair of the dots at the side of the page and the color of the nucleus in each stomatal cell,

3.1.2. Student response to 3D wimba software

Student responses were made with 13 subjects, and 11 students responded. The result was that most students stated that the 3D Wimba 1 software was good and easy to understand, easy to operate and could help students to ease their cognitive burden.

Table 1. Student responses to 3D Wimba software

No	Detail	Score (in %)			
		Strongly disagree	Disagree	Agree	Strongly agree
Software feasibility					
1	Wimba 1 software is suitable for use		27.3	36.4	36.4
2	wimba 1 software confuses me	9.1	90,9		
3	Wimba1 software inspired me			81.8	18.2
Feasibility of teaching materials (plant tissue)					
4	Teaching materials represent enough to understand the topic of plant tissue			63.6	36.4
5	Various types of plant tissue that are shown to be incomplete make me not understand about plant tissue		63.6	36.4	
Precision					
6	The color of the plant tissue that is displayed can not help to understand the character of plant tissue	9.1	54.5	36.4	
7	Colored plant tissues can build imagination about actual plant tissue		9.1	72.2	18.2
8	3D forms of plant tissue make me confused		100		
9	I can build the plant's imagination about the structure and function of plant tissue after seeing 3D plant tissue			72.7	27.3
10	The form of cells in the 3D wimba1 plant tissue, according to the truth		9.1	90,9	
11	The shape of cells in plant tissue the 3D wimba1, does not suit my imagination		90,9	9.1	
Aesthetics					
12	3D wimba1 software made with aesthetics			81.8	18.2
13	3D wimba1 software display is not good		81.8	18.2	

Respondents generally responded positively about the 3Dwimba software (see Table 1). Most respondents said that the Wimba 3D software has inspired. Teaching materials also represent enough

plant tissue material. The plant tissue shown is also quite complete. In terms of precision, respondents responded that the colors used can help understand the character of plant tissue and build the imagination of the actual shape of the plant's anatomy. The form of cells and tissues that are made is said to be good. All respondents agreed that they could build the imagination of plants after seeing the 3D form of plant tissue. Software aesthetics are better to be explored.

4. Conclusion

This paper has develop an interactive animated 3D media using Wimba. The 3D wimba interactive animation media software application using Blender game engine is summarized as follows: (1) Learning Media 3D anatomy of plant anatomy can be developed using Blender software with planning, modeling, construction, system submission to experts and users, ending with software support and development for the next stage; (2) Development of 3D wimba Interactive Animation Learning Media for cell and tissue material in plant anatomy by using Blender application for students suitable to be used based on the following aspects:(a) The feasibility of software, the software is suitable for use; (b) The feasibility of teaching materials, teaching materials have represented plant material and cell tissue; (c) Precision, cell shape, precision and detail; and (d) Software aesthetics are better to be explored.

Acknowledgments

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