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IMPLEMENTATION OF 3D SOFTWARE TOWARDS REPRESENTATION MICROSCOPIC AND SPATIAL INTELLIGENCE OF PROSPECTIVE BIOLOGY TEACHERS

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ABSTRAK

Perkembangan teknologi saat ini adalah salah satu hal yang tidak dapat dihindari, ini menjadi salah satu peluang terutama di bidang Pendidikan. Tujuan dari penelitian ini adalah untuk menentukan pengaruh pengunaan perangkat lunak 3 dimensi (3D) pada kuliah anatomi tumbuhan menggunakan aplikasi blender dan 3DS Max. Metode penelitian yang digunakan adalah kuasi-eksperimenmenggunakan desain penelitian *The Matching Only Pretest-Posttest group design* kelompok. Populasi dalam penelitian ini adalah calon guru biologi di departemen pendidikan biologi fakultas keguruan dan ilmu pendidikan di tahun akademik 2017-2018 di Universitas Siliwangi yang mengontrak mata pelajaran dalam anatomi tumbuhan. Teknik pengambilan sampel yang digunakan adalah purposive sampling sebanyak 40 siswa, dasar pengambilan sampel adalah tingkat keaktifan yang sama. Sementara kesimpulan dari penelitian ini adalah bahwa tidak ada perbedaan dalam kecerdasan spasial dan representasi mikroskopis mahasiswa, selain itu mahasiswa masih mengalami kesulitan bagi mereka yang menggunakan perangkat lunak 3Ds Max, karena memerlukan spesifikasi komputer yang cukup tinggi.

Kata Kunci: Perangkat lunak 3D, kecerdasan spasial, representasi, calon guru

ABSTRACT

The development of technology today is one of the things that cannot be avoided, it actually becomes an opportunity for one of them in the field of Education. The aim of this study was to determine the effect of using the 3-dimensional (3D) software on plant anatomy lectures using blenders and 3ds max. The research method used was quasi-experimental using the research design of the Matching Only Pre-test Post-Test group design. The population in this study were prospective biology teacher in the biology education department of the faculty of teacher training and education at the University of Siliwangi 2017-2018 academic year who contracted subjects in plant anatomy. The sampling technique used was purposive sampling as many as 40 students, the basis of sampling was the same level of activity. While the conclusion of this study is that there are no differences

in spatial intelligence and student representation, besides that students still have difficulties for those who use 3ds max software, because it requires sufficient computer specifications.

Keywords: 3D Software, spatial intelligence, representation, prospective teachers

INTRODUCTION

The use of learning media is something that is usually done in science learning. Learning media is used by teachers to assist in conveying learning to students in science learning and also how the science process itself takes place. Along with the existing technological advances, the use of learning media used today can lead to skills in the 21st century, the Partnership for 21st Century Skills framework includes four learning and innovation skills — critical thinking, communication, collaboration, and creativity — along with life and career skills, information, media, and technology skills, and core academic subjects [1]. One other important thing in education is spatial intelligence.

Spatial intelligence can be inferred from the ability to invoke and use particular, representations and reasoning [2]. If we are to be most effective in fostering spatial thinking, we need to identify the basic components of this form of thinking so that training can be aimed at these fundamental components [3]. Spatial-visual intelligence has been defined as being capable of visualizing or producing an image that characterizes the space world [4]. Spatial intelligence is essential to the everyday lives of people, especially in navigational needs, and also for faster mathematical and decision-making skills [5].

Spatial intelligence can also provide benefits for students in the future. Therefore, a prospective biology teacher must also have skills in the 21st century and spatial intelligence in order to be able to provide the best learning to students in the future, because if only by relying on conventional learning using direct learning models, of course it will not be too good for students, because direct instruction learning is more likely to be learning that is only teacher centred learning without regard to the potential of the students.

One component in spatial intelligence is spatial representation and spatial reasoning which includes spatial perception, spatial visualization and mental rotation [3]. In this case, one of the appropriate materials in conveying spatial representation is the anatomy of plants. In learning plant anatomy, prospective teacher students are trained in representing images of plant cells, tissues and organs based on what they observe in classroom learning. Learning the previous plant anatomy using conventional 3-dimensional media using play-doh has already been done. The results by using the Wimba learning model assisted with 3-dimensional media play-doh can help students in improving their logical thinking skills, high-level thinking skills and learning outcomes of prospective biology teacher students, previous research using 3Ds Max software in making 3-dimensional shapes [6] [7] . However, along with the technological advances that exist today, the use of other computer-based 3-dimensional media that is easier and need to be developed, one of them is 3D Blender.

The 3-dimensional media that can be used in building 3-dimensional objects on computer software is quite a lot, some of which are Max 3Ds, Blenders, AutoCAD, 3D Maya, Google SketchUp, ZBrush and Rhino3D. In this study the computer program used is 3Ds Max and Blender, because each software is more easily available installed on the computer and the tools are more suitable and complete to be used in imagining the shape of 3 dimensions of plant tissue [8] [9]. Will use this media in advance to practice, and prospective biology teacher students must first understand the material of plant anatomy.

The aim of this study was to determine the effect of using the 3-dimensional (3D) software on plant anatomy courses using 3Ds Max and Blender 3D toward Spatial Intelligence and Representation of Biology Prospective Teachers.

RESEARCH METHOD

Participants

This research is an experimental research. using a quasi-experimental design, namely The Matching-Only Pre-test Post-test Control Group Design, this design differs from random assignment with matching only in the fact that random assignment is not used [10]. The population in this study were 122 prospective biology teachers from the one of University in Tasikmalaya who contracted the plant anatomy course. Sampling was done by purposive sampling, was the same level of activity with the aim of seeing students who had enough computer specifications to use, so there were 40 samples, 20 prospective biology teacher students in the control class using 3Ds Max and 20 experimental class students who used 3D Blender, because 3Ds Max is a software commonly used in previous learning.

Instrument Test and Procedure

The instrument used is the spatial intelligence test and an assessment of the microscopic representation of plant tissue made by students using 3Ds Max and 3D Blender software, the tissue observed includes basic tissue, dermal tissue and vascular tissue.

The research procedure begins by giving a pre-test at the beginning of the week to find out the spatial intelligence abilities of students, then the next process is to provide introductory material to students about plant tissue, after which students do the practicum by making transverse and longitudinal incisions of plant tissue, then the students describe it in 2-dimensional form on the worksheet, after that students form a 3-dimensional image using a computer software.

RESULTS AND DISCUSSION

Result

The results of this study are to see how the average difference in spatial intelligence and microscopic intelligence scores of prospective biology teacher students by using the Wimba learning model assisted with 3Ds Max and 3D Blender media, the criteria for 3-dimensional work evaluation refer to the assessment of Starko and Tabrani [11] [12] The

results of this study are as follows in table 1.

Table 1. Results of Spatial Intelligence and Microscopic Representation.

No	Score	Mean	
		3Ds Max	**3D Blender**
1	Spatial intelligence pre-test	4.85	5.325
2	Spatial intelligence post-test	5.25	6.025
3	Spatial intelligence N-Gain	0.09	0.11
4	Representation microscopic	3.7	3.82

The results showed the average score of pre-test, post-test and N-Gain in classes using 3D and Max 3D Blender has an average value that is not so far. Both classes have an average value of N-Gain which belongs to the low category. The results of the calculation using the U Mann Whitney Test against the post test of both classes obtained Sig or P Value of 0.296> 0.05, this shows there is no difference in the average score of spatial intelligence between classes using 3D Blender and 3Ds Max.

The following is a microscopic representation of prospective biology teacher students using 3D Blender and 3Ds Max software.

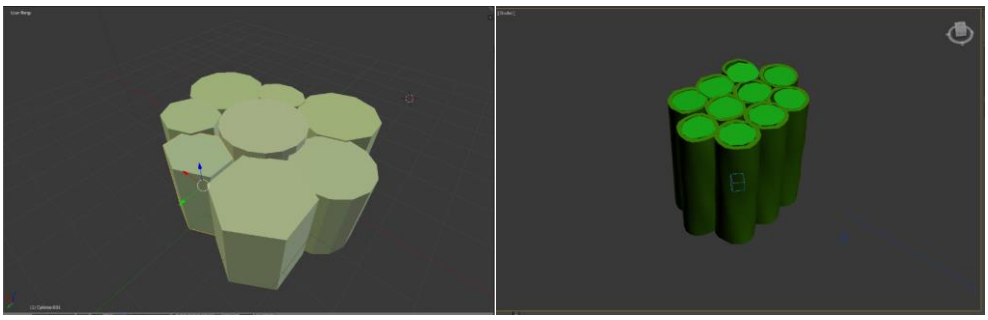

Figure 1. Examples of Microscopic Representation of Basic Tissues in Plants Using (a) 3D Blender and (b) 3Ds Max.

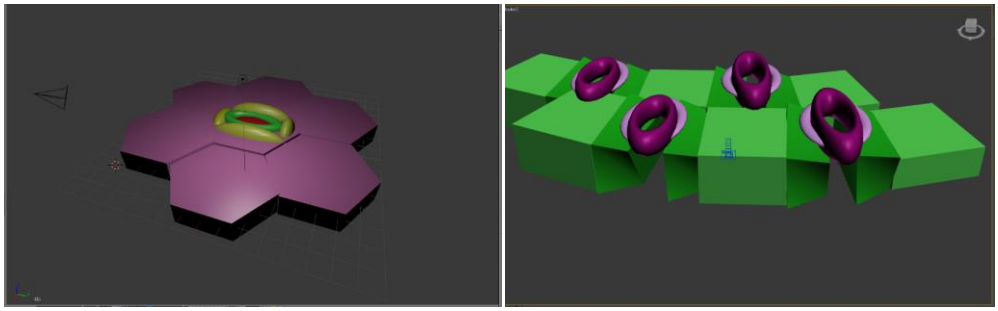

Figure 2. Examples of Microscopic Representation of Dermal Tissue in Plants Using (a) 3D Blender and (b) 3Ds Max.

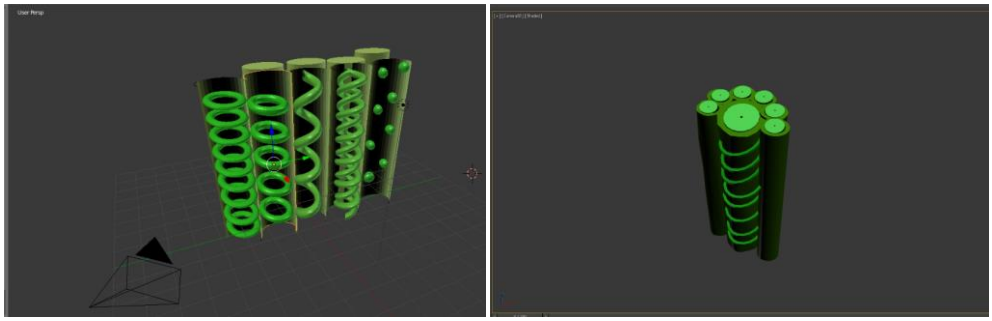

Figure 3**.** Examples of Microscopic Representation of Vascular Tissue in Plants Using (a) 3D Blender and (b) 3Ds Max

The results of the average score of microscopic representation of prospective biology teacher students also showed not too far. Both classes have an average value of microscopic representations that belong to the medium category. The results of calculations using the Mann Whitney U Test on the value of the 3D images of both classes were obtained Sig or P Value of 0.169> 0.05. it shows that there is no difference in the average score of microscopic representation between classes using 3D Blender and 3Ds Max.

Discussion

In order to form the 3-dimensional image requires good basic theory of plant tissue concept, as well as observations from various angles, especially the transverse and longitudinal incisions of plant tissues that were previously, because spatial intelligence needs understanding of perspective and geometric shape [13]. In addition, the basic use of software also needs to be taught in advance so that prospective biology teachers can pour the 3-dimensional imagination of the incisions and 2-dimensional images into 3-dimensional software. Computer

software for 3-dimensional instruction should enable students to see and transform a solid represented on the screen in several ways, helping them to acquire and develop capabilities Visualisation in 3-dimensional context [14]. The 3-dimensional images produced from both software (3Ds Max and 3D blender) are quite good, the features available are also very complete, allowing prospective biology teachers to form various plant tissue objects that are needed and desirable based on 2-dimensional observation.

The ability to make the 3-dimensional object is also training in the formation of the Students ' spatial intelligence, because here students are required to imagine drawing on a 2-dimensional observation and. The training is clearly very useful in the development of soft skills and hard skills students, especially in the current globalization era Acceleration of developments technology of information and communication, and also in the training pedagogical technological content knowledge as a prospective biology teacher, because with that knowledge teachers can develop their professional, easy to find information can make teachers easily find the latest problems in education and find and apply various learning strategies accordingly [15].

Basically, there is no real difference for spatial intelligence and microscopic representation of prospective biology teacher students. the tools contained in the software are also very representative in making 3-dimensional shapes from plant tissues. However, in the use of 3D Blender is more recommended, because the program is free, easy to download, the file size is not too large and does not require high computer specifications. While using 3Ds max requires a fee to use the program, because only get a trial period of 30 days, the file size is quite large and requires high computer specifications. The use of 3Ds Max can be used if the basic mastery of 3D software is strong enough as well as a more complex 3-dimensional form.

Besides that, routine training for students also needs to be given in using a 3-Dimensional computer program [8], so that the results obtained can be maximized and in accordance with the expectations of the lecturer. Motivating students is also

important because sometimes there are still students who have difficulty in making 3-dimensional forms and then give up. Because we live in an era of technological development [16], including 3-dimensional technology will continue to develop in the future.

CONCLUTION

In this study as indicated, there are no differences in means of spatial intelligence and student representation, in control classes that use 3Ds Max and experimental classes that use 3D Blender. besides that, students still have difficulties for those who use 3ds max software, because it requires sufficient computer specifications. Therefore, the use of 3D blender is more recommended because the program is open-source, easy to download, the file size is not too large and does not require high computer specifications. That does not mean 3Ds Max software is not good, such software is very good to use because it has more complex features especially for professional needs that work in the 3-dimensional field.

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