MULTIMEDIA-ASSISTED DIRECT INSTRUCTION LEARNING MODEL ON STRUCTURES AND FUNCTIONS OF PLANTS TISSUE

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Abstract

This research was intended to find out students' level of understanding on the concept of structures and functions of plant tissue through implementation of multimedia-assisted direct instruction learning model. This study was conducted from June 2014 to February 2015. This research was carried out in an experimental, pretest-posttest control group design. The population in this study was students from class XI.IA1 to XI.IA5 inSenior High School1 Bandar Baru, Pidie, Indonesia, with the total of 125 students. The samples were determined by purposive sampling technique, and further divided into two classes, namely experimental class (XI.IA1) and control class (XI.IA2) consisting of 24 and 25 students. The data was collected by giving test consisting of 50 validated questions. It was obtained that the t-test value was higher than t-table value (10,81 > 2,01) at level of significance = 0,05. In brief, students' understanding on the concept of structures and functions of plant tissue had been improved through the implementation of multimedia-assisted direct instruction learning model.

Keywords: multimedia-assisted direct instruction learning model, structures and functions of plant tissue.

1. Introduction

The material relating to the structures and functions of the plant tissue is one of the basic competences (KD) that is learned by the XIth grade students in senior high schools. This basic competence contains the materials on various structures and functions of tissue substances that construct the plants' organs. Therefore, practical-based activities with sufficient infrastructures, teacher's capability in guiding practical work, and teacher's ability in utilizing the media and learning model properly are needed to develop students' comprehension on the concepts. The result of an observation on the learning process of the structures and functions of plants' tissue in class XI IA inSenior High School 1 Bandar Baru showed that students' achievement was still below the minimum passing grade

(KKM) which was 77. This indicated that the students had not yet understood the concepts.

The factors that caused students' lack of comprehension on the concepts were including: 1) the incomplete equipment of the biology laboratory that made teachers of Senior High School1 Bandar Baru spend less time for practical-based learning on the material concerning the structures and functions of plants' tissue; 2) the fact that teachers mostly used conventional teaching methods in which they transferred knowledge directly to students. This method involved a more active role from teachers while students remained passive. This condition made the students unable to directly witness the structure and various plants' tissues (the abstract concept) and became less motivated that hindered the students to comprehend the concept. Thus, in order to provide the students with lessons on the structures and functions of plants' tissue that can be comprehended more easily, the proper learning model and media need to be implemented.

In this study, a learning model of multimedia-assisted Direct Instructions in a form of prezi was implemented in the practical work to provide students with a more concrete learning experience. Direct Instruction is an appropriate learning model for a practical work. It allows students to improve their understanding on procedural and declarative knowledge that are well structured and can be learned step by step to enhance comprehension on the concept. In line with this, Suprijono (2011) mentions that Direct Instruction is designed for procedural and declarative (factual) knowledge as well as other skills comprehension. Direct Instruction is appropriate for explaining lessons in which teachers directly transfer the knowledge to students by making efficient arrangements and sharing the well-defined information or skills to be mastered by students (Slavin, 2011).

The prezi was used to compare the structures of various plants' tissues with the results from microscopic observation done by students. This media could be used as an enhancement for students after doing the practical work. The prezi itself was one of interactive multimedia. Binham (2013) states that prezi is one of

the presentation softwares beside Powerpoint that is used to make more interactive online and offline presentations so that the learning ideas can be delivered more easily. Prezi becomes superior because this program is facilitated with Zooming User Interface (ZUI) which enables the users to zoom in and out their presentation (Anonymus, 2013c). With the current employment of this facility, prezi was suitable to be used as a learning media in classroom to encourage students' comprehension on the concept.

The concept perception in learning is a stage of ability where someone can understand meaning or concept, situation, and the fact that one knows (Anonymus, 2013b). Concept comprehension can be differentiated into seven indicators, namely: (1) Restating a concept; (2) Giving examples and non-examples of the concept; (3) Presenting the concept into various representations; (4) Developing a need condition or sufficient condition of a concept; (5) Using, utilizing, and choosing certain procedure or operation; (6) Classifying objects based on certain characteristics or according the concept; (7) Applying concept in problem solving (Anonymus, 2013a)

In this study, the results of multimedia-assisted Direct Instructions implementation to enhance students' concept comprehension on the structures and functions of plants' tissue material were presented.

2. Method

The Developed Learning Model

In this case, the multimedia-assisted Direct Instructions learning model with prezi entitled "The Structures and Functions of Plants' Tissue" was organized in a form of offline presentation.

Research Object

The multimedia-assisted Direct Instructions learning model with was employed on 125 students of XI IA in Senior High School1 Bandar Baru. Based on the result of the pretest, two groups of research object were chosen. The first

group was class XI IA 1 as the experiment class with 24 students. Meanwhile, the second group was class XI IA 2 as the control class with 25 students. The experiment class was given treatment by the implementation of multimedia-assisted Direct Instruction learning model, while the control class was taught by the conventional learning model. The success of the implementation of multimedia-assisted Direct Instructions was determined by the difference of N-gain from the experiment and control class.

Kinds of Test

The kind of test that was used on pretest and posttest was multiple choice with the total of 50 questions. These tests were used to measure the improvement of students' concept comprehension.

Research Procedure

This study was carried out using Pretest Posttest Control Group Design. The pretest was given to both experiment and control classes before the learning process began. Then, the treatment by using Direct Instructions with a multimedia assistance was implemented in the experiment class and the conventional learning model was practiced in the control class. The posttest was given in both classes at the end of learning process to see the effectiveness of the implemented learning models.

Data Analysis

The data on students from experiment and control classes' concept perception was identified from the pretest and posttest scores. The "gain" was computed by reducing the posttest with the pretest score and then normalized with the formula proposed by Cheng et al. (2004) that is written as follow:

$$\text{N-Gain} = \frac{\text{Posttest Score} - \text{Pretest Score}}{\text{Maximum Score} - \text{Pretest Score}} \text{ x } 100$$

The rate of N-gain achievement was categorized into three categories, namely: high: N-gain > 0,7; middle: 0.3 ≤ N-gain ≤ 0,7; and low N-gain < 0,3 (Cheng et al., 2004).

The mean difference testing from the experiment and control class would be done with "t-test" if the data from the experiment and control class was distributed normally with the same variance (homogenous). Meanwhile, the "Mann-Whitney test" would be used if the data between the experiment and control class consisted of different variances (heterogeneous). Before the "t-test" and "Mann-Whitney test" were carried out, the data was first tested with the normality (the data of N-gain) and homogeneity tests between the experiment and control classes which was manually done using Microsoft Excel and Statistical Product and Service Solutions (SPSS) software version 16.0. The decision on the normality, homogeneity, t-test, and the Mann-Whitney test were taken based on the comparison of probability/significance (sig.) values with 95% validity rate ($p<0,05$).

3. Result and Discussion

Determining The Experiment and Control Class

The pretest data was used to note the XI IA in Senior High School 1 Bandar Baru students' concept perception before giving the treatment. The pretest analysis of concept perception between students in the experiment and control groups is presented in Table 1.

Table 1. Mean Results from Pretest Score of Students in Experiment and Control Groups

Mean	**Groups**		**Normality***)		**Homogeneity****) (Exp & Ctrl)	**Significance**
	Exp	**Ctrl**	**Exp**	**Ctrl**		
Concept Perception Test	35,42	34,40	Normal χ^2 value (0,15) < χ^2 table (7,815)	Normal χ^2 value (1,62) < χ^2 table (7,815)	Homogenous F value (1,27) < F table (2,01) α (0,05)	Not significant t value (0,54)<t table (2,01)

Note: Exp = Experiment
Ctrl = Control
*) = Chi Square Test (Normal, χ^2 value < χ^2 table, $\alpha = 0,05$)
**) = F test (Homogenous, F value < F table, $\alpha = 0,05$)

Based on the above data analysis on Table 1, it was shown that students from both control and experiment groups had equal or insignificant difference in terms of ability. The similarity could be seen on the t-test value from either groups compared to the mean of concept perception test that showed the t value (0,54) < t table (2,01) on the level of significance (α) = 0,05. It means that there was no difference on experimental and control groups' students' ability before treatment.

Students' basic knowledge showed how much they understand the knowledge and concept concerning the learning material that was presented in this study. It was important for teachers to know students' ability before beginning the learning process due to students' different capabilities. Thus, teachers would know whether the students had fulfilled the required knowledge that was needed to face the material to be given. This information could assist teachers to plan the learning process which correspond the learning target to achieve a meaningful learning.

The basic knowledge the students had was one of the influencing factors that affected the concept comprehension on the material given by teachers. After conducting the basic comprehension test on the structures and functions of plants' tissue, the students were expected to improve their understanding on the concept. In the experimental class, the teacher employed the multimedia-assisted Direct Instructions learning model. Meanwhile, the control class was provided lesson in conventional learning method in which teacher employed the material from the Students' Work Sheet (LKS) and gave speech with question-answer session without having practical work.

Post-Treatment Concept Perception of Experimental and Control Groups Students

The improvement on students' concept perception could be indicated by calculating the difference of pretest and posttest scores (gain). The gain

normalization (N-gain) was employed to identify students' original scores as well as to clearly note the change on the level of concept understanding between the experimental and control classes before and after the treatment was carried out.

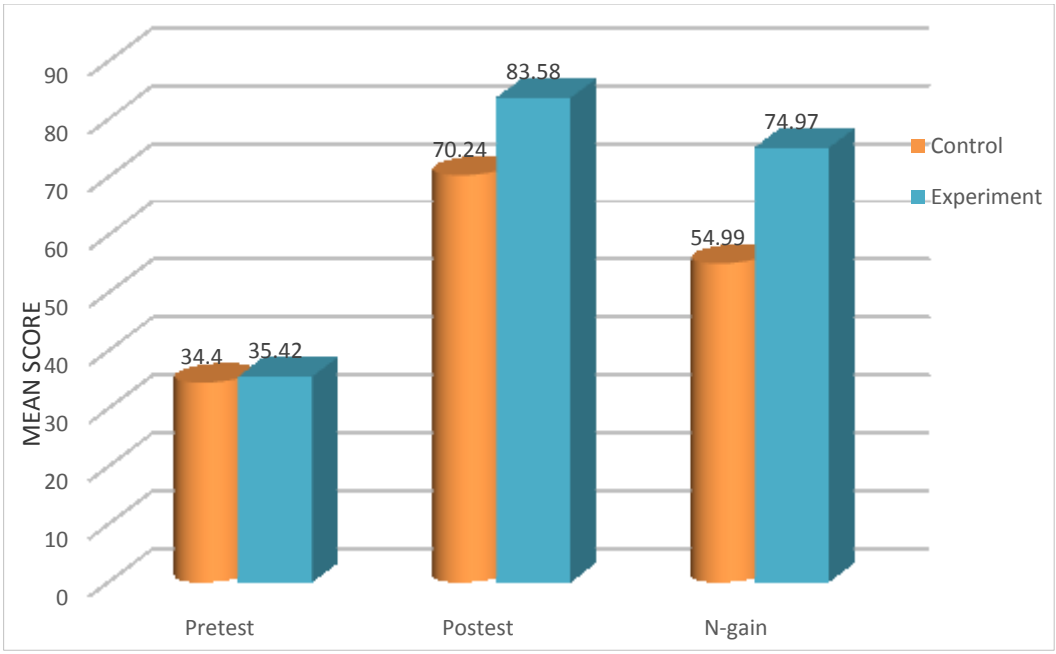

Figure 1. Pretest-Posttest Mean Scores Comparison and Structures and Functions of Plants' Tissue N-gain Concept Perception of Experimental and Control Groups' Students

Figure 1 above shows the mean of N-gain in experimental class that was 74,97 which was included in high category and N-gain mean of the control class that was 54,99 which was included in middle category. From this data, it could be concluded that there were some differences and improvement on students' concept comprehension of structures and functions of plants' tissue in the experimental class that was taught using Direct Instructions learning model with multimedia aid and the control class that was taught using the conventional learning model.

The concept perception was one of the measurements of students' accomplishment on the learning goals that was indicated by the ability to remember, explain, identify, and analyze the correlation between one concept and another in a learning process. The difference between both groups in terms of

concept perception in post-learning period was due to the distinct treatments given during the learning process. The multimedia-assisted Direct Instructions learning model that was implemented in the experiment class helped students to become more capable in developing concept. The relevant practical work led students to think actively without having the teacher explained the concept description constantly. On the other hand, the control class was dominated with a conventional learning model in which teacher deliver the lesson a form of speech with several question-answer sessions without employing any practical work.

The data analysis result of students' perception on the learning material regarding the structures and functions of plants' tissue showed a significant difference of post-learning period from the experimental class, as shown in Table 2.

Table 2 The t-test result on Concept Perception of Experimental and Control Groups

Groups		**Normality*)**		**Homogeneity**) (Exp & Ctrl)**	**Significance**
Exp	**Ctrl**	**Exp**	**Ctrl**		
74,97	54,99	Normal χ^2 value (-2,43) < χ^2 table (7,815)	Normal χ^2 value (4,61) < χ^2 table (7,815)	Homogenous F value (0,57) < F table (2,01) α (0,05)	Significant t value (10,81) > t table (2,01)

Keterangan: Exp = Experiment
Ctrl = Control
*) = Chi Square Test (Normal, χ^2 value < χ^2 table, α = 0,05)
**) = F Test (Homogenous, F value < F table, α = 0,05)

The statistical analysis result in Table 2 indicated that the t-value = 10,81 ≥ t-table = 2,01on the degree of freedom = 47 and α = 0,05. This number proved the significant difference of the improvement of concept perception between students from the experiment class which was given treatment with Direct Instructions learning model with multimedia aid and the control class which was

taught using the conventional method. From the result, it could also be seen that students of Senior High School 1 Bandar Baru taught using the multimedia-assisted Direct Instructions had better concept perception on the structures and functions of plants' tissue material than those who were given lesson in conventional method.

The result of this study was in line and therefore supported by several other previous studies, such as one conducted by Setiawan, et al. (2010) who states that through the implementation of Direct Instructions, all students would have the opportunity to learn and understand the whole knowledge as well as other skills that encourage students to be more focus and creative. In addition, Sakti (2012) points out that the direct interface (Direct Instructions) learning model with Macromedia Flash animation-based media assistance would have a significant effect on the improvement of students' perception on physical concepts and their learning interest.

4. Conclusion and Remark

Based on the explanations presented on the previous sections, it could be concluded that the implementation of multimedia-assisted Direct Instructions learning model could significantly enhance Senior High School1 Bandar Baru students' concept perception on the structures and functions of plants' tissue in an effective way.

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