

The Effectiveness of Experimental Methods on The Learning of Science Materials Plant Development With Hydroponic Techniques on The Learning Outcomes of Students

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Abstract

The experimental method can also be interpreted as a way of presenting lessons, where students conduct experiments by experiencing and proving themselves something that is learned. The focus of research 1) Knowing the learning outcomes of students who do not use experimental methods in science learning material on plant breeding with hydroponic techniques in class VI MI NU Tamrinut Thullab Undaan Kudus, 2) Knowing the learning outcomes of students who use experimental methods in science learning material on plant reproduction with hydroponic techniques in class VI MI NU Tamrinut Thullab Undaan Kudus, 3) Knowing the effectiveness of experimental methods in learning science on plant propagation material with hydroponic techniques on the learning outcomes of class VI students of MI NU Tamrinut Thullab Undaan Kudus. Based on the results of the calculation of the significant test comparison of student learning outcomes in the pre-test and post-test, the t value is 5.85 compared to the t table ($dk = n-1 = 28$ and the error rate is 5% for two parties based on $dk = 28$ with an error level of 5% it turns out that the price of t table for one party = 2.048 because t count is greater than t table or falls on acceptance of H_a . ($5.85 > 2.048$), then H_a is accepted or H_o is rejected, so the conclusion is that there is a positive and significant difference in the pre-test and post-test learning outcomes besides that there is also a difference between the average learning outcomes of experimental class students who are given teaching with the control class using conventional learning. Based on the results of the calculation, the average result of the students who were given teaching using the experimental method was 89.31, while the average value of the learning outcomes of control class students using conventional learning was 74.33. It can be concluded that the use of experimental methods is effective in improving student learning outcomes in science subjects on plant propagation material using hydroponic techniques.

Keywords: Experimental Method, Hydroponic Technique, Learning Outcomes

INTRODUCTION

Learning outcomes are changes in overall behavior that a person has regarding changes in cognitive, affective, and psychomotor behavior. Based on observations made by researchers at MI NU Tamrinut Thullab Undaan Kudus, only cognitive values are important, because students and teachers assume that students with high cognitive scores must have high affective and psychomotor values. And every semester the madrasa provides a file of reports on the learning outcomes of students, including only their cognitive values. In this study, the researchers examined the cognitive, affective, and psychomotor learning outcomes at MI NU Tamrinut Thullab Undaan Kudus.

The cognitive domain is a domain that includes mental or brain activities. In the cognitive realm, there are six levels of thought processes, namely knowledge or memory, understanding, application, analysis, synthesis and evaluation. The affective domain is the realm that deals with values and attitudes. The affective domain by Krathwohl and colleagues on taxonomy becomes more detailed in five levels, namely: receiving, responding, valuing, organization, characterization by value or value complex. The psychomotor domain is one that is related after a person has received a certain learning experience. Trowbridge and Bybe classify the psychomotor domain into four categories, namely: 1) moving, 2) manipulating, 3) communicating, and 4) creating. M.Fahrudin, S.Pd.I, one of the sixth grade science teachers at MI NU Tamrinut Thullab Undaan Kudus explained that during learning in one semester he only did practicum twice, even then only on certain materials that required practicum to be held by teachers and class students. VI to fulfill the syllabus, and the rest still use the lecture learning method. This shows that the experimental method is rarely used by teachers for science learning at MI NU Tamrinut Thullab Undaan Kudus.

Based on the results of interviews that have been conducted by researchers, it shows that the material for plant breeding is material that requires practice, not only using the lecture method which offers pictures in explaining the propagation of plants. This can be seen from the learning outcomes of students showing that the average score of students is much lower than the minimum KKM. The average score of students is 68 while the minimum completeness criteria limit or KKM determined by the madrasah is 75. Students find it difficult when asked to work on questions because students rely on memorization received from teachers who use the lecture learning method.

This learning is difficult for students because they have to apply concepts, apply and solve problems abstractly without being directly involved. Teachers have not provided direct experience so students tend to get bored faster and less enthusiastic in participating in learning. Science learning should not only be taught how to solve problems quickly and instantly. Science learning must understand thoroughly in understanding concepts, so that learning is easily accepted and understood by students. How to understand the correct concept, not only how to solve problems but must apply IPA concepts in everyday life

One alternative that researchers can do to overcome this problem is to use the experimental method. The experimental method is considered very effective in learning, because it is easy for students to remember. With the experimental method, teachers can develop physical and mental involvement, as well as emotionally of students. Students have the opportunity to practice process skills in order to obtain maximum learning outcomes. Experience directly experienced can be embedded in his memory. It is hoped that the physical and mental and emotional involvement of students can be introduced to a learning method or condition that can foster self-confidence and innovative and creative behavior. Students learn actively by following the learning stages. Thus, students find their own concepts according to the results obtained during learning. (Haryono, 2013).

By using the experimental method, students can prove the truth through direct experience that has been done, not just accepting raw subjects given and said by the teacher. The direct experience made by students will be easy to remember and of course the students have already solved the problems given by the teacher. As well as the goal of science that the development of children's skills is important in learning both in making observations, formulating problem frameworks, comparing, and drawing conclusions. Based on the explanation of the scientific objectives, it can be concluded that the experimental method is very appropriate for improving student learning achievement. Develop skills to acquire, develop, and apply scientific concepts.

In this context, the skills in question include intellectual skills, affective skills, and psychomotor skills. These three elements are related to each other and are very difficult to separate. (Sumaji, 2003).

Based on the background described above, this study entitled "The Effectiveness of Experimental Methods in Natural Science Learning of Plant Breeding Materials with Hydroponic Techniques on Learning Outcomes of Class VI Students of MI NU Tamrinut Thullab Undaan Kudus".

METHOD

1. Type of Research

The research model used is Research and Development or Research and Development (R&D). This research method is a method that can produce products in certain areas of expertise followed by certain by-products and have the effectiveness of that product. (Budiono Saputro, 2011). With this method produced can be in the form of a model or module or the other. Product trials are carried out in several stages, namely: material expert testing, instructional media expert, limited trial (small group test), and field trial. The trial design for expert testing, small group testing, and field testing using a descriptive trial design. (Ani Widyawatai, Laily Rochmawati Listityani, 2018).

2. The subject of the trial

The subjects of this study were students at MI Nurul Hidayah Margohayu Karangawen Demak with a total of 24 students.

3. Types of data

Data in the form of statements about the validity of the developed learning media. The data sources are several experts who are competent in the field of learning media development, as well as data on learning activities and learning outcomes.

4. Data collection techniques

In this development research, the data collection instruments used were the results of observations, interviews, questionnaires (questionnaires) and test questions (pretest & posttest) of learning outcomes. The results of observations and interviews are used as data collection techniques if the researcher wants to conduct a preliminary study to find problems that must be scrutinized and to know the things of the respondents in depth. At the product development stage, media validity is the main focus. This validity is based on the opinion of the experts involved as a validator. These validators provide a score for each aspect according to the existing indicators and descriptors. These scores will be processed in accordance with the data processing described in the data analysis method.

5. Data analysis techniques

The data that has been collected is processed descriptively. The quality of the resulting learning media must meet the validity aspect. To review this validity a validity sheet was used. The steps to determine the validity of instructional media are: a) The average total score obtained from each validator; b) The average total score obtained from each validator is added up, then averaged again, hereinafter referred to as the average validity (Rv). The validity of learning media is determined by converting the average validity into qualitative values using the following categories: 1) Very Invalid if $1.00 < Rv < 1.50$; 2) Invalid if $1.50 < Rv < 2.50$; 3) Valid if $2.50 < Rv < 3.50$; 4) Very Valid if $3.50 < Rv < 4.00$. Learning media is declared valid if the minimum average validity is in the valid category ($2.50 < Rv < 3.50$).

RESULTS AND DISCUSSION

In the early stages before the research, the researcher collected several tools or values from the MI NU Tamrinut Thullab Undaan Kudus which would be used as a starting point for conducting research. In addition, the researcher also looked at the symptoms and problems that exist in MI NU Tamrinut Thullab Undaan Kudus, the initial ability of the class to be used as the object of research needs to be known whether it is the same or not. Therefore, the researcher took odd semester test scores of class VI students as the initial data value. Based on the preliminary data analysis, the calculation results obtained that the average value for class VI A was 74.3. From the calculation of the odd semester scores for class VI A and class VI B, it is known that the two classes are still in the same condition, namely normal and homogeneous. Therefore, the two classes deserve to be used as experimental and control classes.

The next learning process, the two classes received treatment (treatments), namely the experimental class using the experimental method while the control class used conventional learning. In the learning process in the experimental class with the experimental method, students are given learning as usual, but what distinguishes it is that before learning, students are required to seek information first about the material to be delivered. In this learning process there is an interaction between teachers and students and results in fun, but serious, learning that is expected to achieve learning goals. Whereas in the control class students are given teaching using lectures and questions and answers, this results in boredom for both teachers and students, learning also becomes monotonous. After the final learning process the experimental group and the control group were given the same final test (post-test), namely 10 essay items.

The final test (post-test) was carried out after learning in the experimental class. Based on the results of the tests that have been carried out, the average learning outcomes of the experimental class VI B is 89.31 so that the final data analysis shows that the significant test comparison of the pre-test and post-test students' learning outcomes obtained a t-value of 5.85 compared with the price of t table ($dk = n-1 = 28$ and an error rate of 5% for two parties based on $dk = 28$ with an error level of 5% it turns out that the price of t table for one party = 2.048 because t count is greater than t table or falls on acceptance H_a . ($5.85 > 2.048$), then H_a is accepted or H_0 is rejected, so the conclusion is that there is a positive and significant difference in learning outcomes between the experimental class and the control class. So the conclusion is that there is a significant difference in the pre-test and post-test learning outcomes. Evidenced by an increase in student learning outcomes in the experimental class before and after the treatment was applied. Thus, the results can be determined that "there are differences in learning outcomes between students who are given teaching using the experimental method with students who are given teaching with conventional methods".

The experimental method has a positive impact on student learning outcomes, which can be seen in the theory that the experimental method is designed to help students achieve learning goals that promote problem-solving activities by obtaining new material using questioning techniques and accessing information from trusted sources and exchanging ideas with group members as the subject of learning. With this view, of course, students are not only directed to find the correct answers, but how students can develop understanding and attitudes in accordance with real life in society so that they can work together among group members to remember experiments and learning outcomes.

CONCLUSION

From the foregoing it can be seen that the experimental method can improve the learning outcomes of students in science subjects at MI NU Tamrinut Thullab Undaan Kudus, this can be seen by an increase in the value of student learning outcomes obtained then a summary of the explanation in front is taken, as follows: 1) The learning outcomes of students who do not use experimental methods in science subjects with hydroponic techniques at MI NU Tamrinut Thullab Undaan Kudus are in the high category according to the pre-test interval with an average result calculation of 74.33. 2) Improved learning outcomes of students who use experimental methods in science learning material on plant breeding with hydroponic techniques at MI NU Tamrinut Thullab Undaan Kudus, including in the high category according to the post-test interval. Because the results of the analysis test in the experimental class have an average value of 89.31, it can be said that there is an increase. By using experimental learning methods can motivate students to dare to experiment to produce more innovative work so that students can actively participate in learning. 3) Based on the results of the calculation of the significant test comparison of student learning outcomes in the pre-test and post-test, the t value is 5.85 compared to the t -table price ($dk = n-1 = 28$ and the error rate is 5% for two parties. based on $dk = 28$ with an error rate of 5%, it turns out that the price of t table for one party = 2.048 because t count is greater than t table or falls on acceptance of H_a . ($5.85 > 2.048$), then H_a is accepted or H_o is rejected, so the conclusion is that there is a positive and significant difference in the pre-test and post-test learning outcomes besides that there is also a difference between the average learning outcomes of experimental class students who are given teaching with the control class using conventional learning. Based on the results of the calculation, the average result of the students who were given teaching using the experimental method was 89.31, while the average value of the learning outcomes of control class students using conventional learning was 74.33.

It appears that the average learning outcomes of students who are given teaching in using the experimental method are better than the average learning outcomes of students who are given conventional teaching, even though they are both categorized as "high", but it is clear here that there are differences in levels. the interval class. It can be concluded that the use of experimental methods is effective in improving student learning outcomes in science subjects on plant propagation material using hydroponic techniques.

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