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by Fauziyah Harahap

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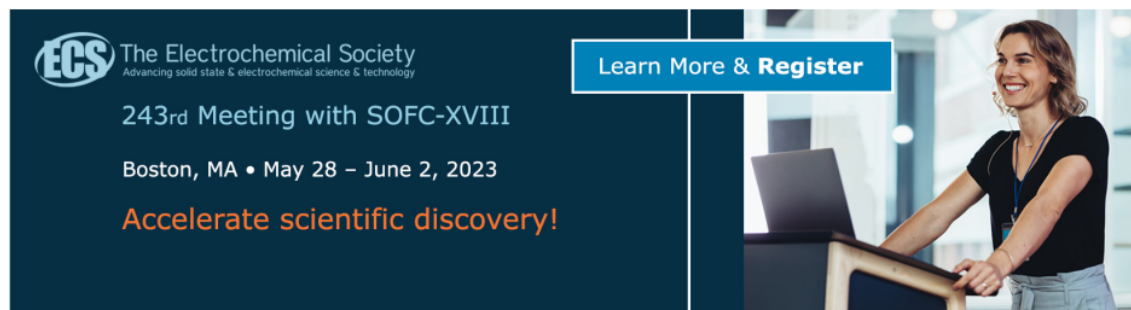
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The Effectiveness of Research Based in *Vitro* Textbook Application in Contextual Learning on Scientific Attitudes Mastery of Biology Students

Eka Sugiati[1*], Fauziyah Harahap[2] and Idramsa[3]

[1]Post Graduate Biology Study Program, University of Negeri Medan, Indonesia
[2]Post Graduate Biology Study Program, University of Negeri Medan, Indonesia
[3]Post Graduate Biology Study Program, University of Negeri Medan, Indonesia

*Corresponding e-mail : ekasugianti1@gamil.com

Abstract, This research aims to determine the effectiveness of research-based in vitro textbooks in achieving students' learning outcomes on scientific attitudes mastery. The population of the study was 74 students of undergraduate Biology study program Semester VI academic year 2019/2020 of Universitas Negeri Medan. The Sample was taken by using perposive sampling technique where the classses were grouped in a control class and an experimental class. The experimental class was given treatment by using research-based textbook while the control class used the textbook which was not research-based. The design of the study used Pretest-Posttest Control Group Design. The research instruments used was a questionnaire. To test the hypothesis the reseacher used t-test. The result showed that the mean of posttest from control class was 81,528 on scientific attitude mastery while the posttest mean of experimental class was 91,026. The t-test in the experimental class showed that t_{count} was $5,413 > t_{table}$ 2,02809 on scientific attitude mastery. Thus the group of students which was given treatment using research-based textbooks had a higher mean score than the group of students without using research-based textbooks.
Keywords: effectiveness, textbook, in vitro, contextual

1. Introduction

Textbooks have an important role in the learning process in order to improve the students' learning outcome as well as improve their character. In designing a textbook for university students, writers should refer the applicable curriculum which is based on the Indonesian National Qualification Framework (KKNI). As [1] stated that the availability of textbooks is also a very important factor in determining the effectiveness of learning. In the process of teaching and learning the subject of in vitro prioritizes the process and research in its learning process. To cover this issue it is needed to design textbooks which are oriented towards these matters.

To meet these needs,[2] has developed a research-based in vitro textbook. The book consists of several discussion topics about in vitro, and more focus on callus induction discussion. It is expected to be one of the textbooks which will be by the biology students in undergraduate biology study program (S1), Universitas Negeri Medan, in order to improve students' ability in developing their critical thinking skills to achieve a better learning outcomes. Research and development as a research approach is aimed to produce new products or improve existing products, which can be justified [3].

A good textbook should consists of good content, language, presentation and graphics [4]. While the content in assessment chapter should meet several components such as: (1) the suitability of the material based on the curriculum, (2) the accuracy of the material, (3) the proficiency of the material based on applicable curriculum and (4) encouraging student curiosity[5].

Scientific attitude is the suitability of student behavior towards the teaching and learning process [6]. The characteristics of scientific thinking attitudes include; logical, analytic, curious, critical, open minded, objective, respecting others, awareness to defend the truth and forward reaching[7]. While [8-10] states that a scientific attitude is an attitude possesed by the students such as : curiosity about objects, natural phenomena, living things and causal relationships that cause new problems which can be solved through correct procedures. Then [11-12] adds that the scientific attitude consists of curiosity, respect for evidence, flexibility towards new ideas, critical reflection, and environmental sensitivity.

Contextual Teaching and Learning (CTL) is a way of presenting learning material by giving students problems to be solved in order to achieve educational goals which is related to their everyday life situation[13]. Based on the background of the problem the study is about the application of the Sipahutar Pineapple (*Ananascomosus L.*) Plant Propagation In*Vitro*reseach-based textbook on Scientific Attitudes Mastery of Biology Students.

2. Research Method

This type of this research was quasi-experimental research, with a Posttest Only Control Group Design. The research was conducted at Universitas negeri Medan. The population used in this research were 74 students of undergraduat Biology study program Semester VI academic year 2019/2020 of Universitas Negeri Medan. The Sample was taken by using perposive sampling technique where the classses were grouped in a control class and an experimental class [14]From the determination of the sample obtained, there were 36 at the controll class and 38 at the experiment class. The experimental class was given treatment by using research-based textbook while the control class used the textbook which was not research-based. The design of the study used Pretest-Posttest Control Group Design. The research instruments used were a test and a questionnaire. To test the hypothesis the study used t-test analysis.

The instrument used in this study was a test of learning outcomes in the form of quesionarie, which initially consisted of 30statements and the results of testing the validity of items and reliability tests using SPSS software version 25,0 was valid and reliability. This test was used as a posttest to find out the differences of learning outcomes in the control and the experimental class after the application of the Reseach Based In Vitro Textbook in contextual learning process. It was hoped this tool can reveal the student mastery on scientific attitude learning outcomes that was treated through the application that of the research based textbook.

Data collection techniques in this research used tnon-test methods. This non-test (questionnaire) method isused to reveal data about the effect of the application of the reseach based In Vitro Textbook in contextual learning process in achieving the students' mastery on scientific attidute learning outcomes. The student learning outcomes then analyzed using statistical tests that include tests of normality, homogeneity, and t test. Measurement of students' mastery on the scientific attitude outcomes using the questionnaire sheet containing 30 items of statements with five answer criteria: very agree (va), agree (a), uncertain (uc) disagree (d), and very disagree (vd). The sampled in the study was 74 students (38 students for the experimental class and 36 for the control class) and all of them were respondents. Data on the students' sheet was obtained through filling out the questionnaire based on Likert scale filled out by students individually. The questionnaire sheet then scaled and analyzed based on predetermined criteria.

3. Research Findings

3.1 The Result of Normality and Homigenity Test

In this study, the reseacher used a different test analysis by using the Independent Sample t-test. Before testing the Independent Sample t-test, the normality and homogeneity tests were calculated. The calculation of this analysis was carried out using the SPSS 25 for windows program. To test the normality and homogeneity, the researcher used the raw values of the pre-test and post-test results of the questionnaires filled out by the samples from the control and experimental classes. The Quesionnaire sheet containing 30 items of statements with five answer criteria: very agree (va), agree (a), uncertain (uc) disagree (d), and very disagree (vd). The sample in this study was 74 students (38 students for the experimental class and 36 for the control class) and all of them were respondents. Data on the students' sheet was obtained through filling out the questionnaire based on Likert scale which is filled out by students individually. The questionnaire sheet then scaled and analyzed based on predetermined criteria.

Table 1. The calculation of Normality Test of Experimental Class

	Number of Sample	Sig. Value
Pre-Test	38	0,200
Post-Test	38	0,096

Based on the result of the calculation, it can be concluded that the data has a significance value more than 0,05in the pretest and postest, so it can be stated that the data obtained is normally distributed. This can be seen from its significance value obtained from the pre-test results is 0.200> 0.05 and the post-test 0.096> 0.05, and it can be concluded that the data is normally distributed. Thus the analysis process can be continued in testing the research hypothesis.

Table 2. The Calculation of Normality Test of Control Class

	Number of Sample	Sig. Value
Pre-Test	36	0,044
Post-Test	36	0,200

Based on the result of the calculation, it can be concluded that the data has a significance value more than 0,005 in the pretest and postest, so it can be stated that the data obtained is normally distributed. This can be seen from its significance value obtained from the pre-test results is 0.044 > 0.005 and the post-test 0.200 > 0.005, and it can be concluded that the data is normally distributed. Thus the analysis process can be continued in testing the research hypothesis.

Table 3. The Calculation of Homogenity Test of Controll and Experimental Class on the Application of Reseach Based In Vito Textbook and Without Research Based

Variances	Sig. Value	Description
Experimantal and Controll Class	0,917	Homogenity

Based on the result of the calculation, it can be concluded that the result of homogenity test significance value is 0,917 > 0,05 in the pretest and posttest of the experimantal and controll class. It can be concluded that the overall data is homogenity. Thus the analysis process can be continued in testing the research hypothesis.

3.2 The Result OfHyphotesis Testing

The Hypothesis testing was carried out by using the independent sample t test. It was done because the data is homogeneous and normally distributed. The process of calculating the value of t coefficient on the independent sample t test by using the software of SPSS 25.0 for Windows program. There are several things that must be considered in interpreting the results of the t test. If the variance of the two variables are similar, the t coefficient value must be read equal variance assumed. If the variance of the two variables is different, then in the t test value must be read different assumed.To determine whether the two variances are equal or not, theF-test was carried out. This F-test obtain to interpret the variance of the two variables whether they are equal or not.

The following is an interpretation of the t-test:

Table 4. The Calculation of t-Test of The Effectiveness of Reseach Based In Vitro Textbook Application in Contextual Learning on Scientific Attitudes Mastery

Group	N	Mean	Std. Deviation	Std. Error Mean
Controll Class	36	81,528	7,7071	1,2845
Experimental Class	38	91,026	7,3869	1,1983
Equality of Varience sig				0,917
T $_{count}$				5,413
T $_{table}$				2,02809
Sig.(2 tailed)				0,000

Based on the statistical output group table above, the number of sample from the control class group is 36 students and the experimental class group is 38 students. The post-test mean score of the control class group was 81.528 while the experimental class group was 91.026. Thus it can be concluded that there are differences on the mean test results on the application of In Vitroreseach based textbook "Propagation of Pineapple Plants (*Ananascomosus L.*) Sipahutar than the one without reseach based written by Dr. Fauziyahon biology students'Scientific Attitude mastery

Based on the output table, the results of the independent sample t test above showed that the sig value. Levene's Test for Equality of Variences is 0.917 > 0.05, so it can be interpreted that the data variance between the control class and the experimental class is homogeneous or equal [15].While the Equal variances assumed table, it showed that the value of sig. (2 tailed) is 0.000 < 0.005 and it can be concluded that Ho is rejected and Ha is accepted. Then it can be concluded that there is a significant difference between the test result of the control class and the experimental class on the application of In Vitro reseach based textbook "Propagation of Pineapple Plants (*Ananascomosus L.*) Sipahutar than the one without reseach based written by Dr. Fauziyah on biology students' Scientific Attitude mastery

The decision is based on the comparison of the t $_{count}$ with the t $_{table}$

- If the value of t count <t table then Ho is accepted and Ha is rejected, which means there is no difference in the average test scores of the control class and the experimental class.
- If the value of t $_{count}$> t $_{table}$ then Ho is rejected and Ha is accepted, which means that there is a difference in the average test scores of the control class and the experimental class.

From the table above, it is known that the t $_{count}$ is 5.413 and the t $_{table}$is 2.02809. So it can be concluded that t $_{count}$> t $_{table}$ (t $_{count}$ 5.413> t $_{table}$ 2.02809) and the sig value is 0.000 <0.005 and Ho is rejected so it can be concluded that there is a significant difference between the test results of the control class and the experimental class in the application of In Vitro reseach based textbook "Propagation of Pineapple Plants (*Ananascomosus L.*) Sipahutar than the one without reseach based written by Dr. Fauziyah on biology students' Scientific Attitude mastery

4. Discussion

Science Process Skill is closely related to Scientific Attitude mastery because in learning biology science, each student must have Scientific Attitude in order to do scientific work such as observing, communicating, measuring and others. Scientific work is a Science Process Skill which is supported by open minded attitude, critical thinking, in defendency, respecting other people's opinions, honesty, patience, thoroughness, accuracy and discipline which are part of the scientific attitude that must be carried out by students. Scientific attitude is one of the outcomes of learning biology science. The scientific attitude is also one of the scientific principles in carrying out the scientific autonomy. Developing a scientific attitude in science learning can foster career interest in science[16]. Sugiono [14] stated that there are six indicators of scientific attitudes, namely: (1) curiosity; (2) evidence priority; (3) skeptical / not easy to believe; (4) accepting differences; (5) work together and (6) be positive.

Characteristics of a scientific attitude has an open view, as [4] states that an important scientific attitude is developed in learning process because it can train the students' awareness and politeness in asking and arguing questions, wanting to know, caring for the environment, willing to cooperate, opening, diligent, careful, creative, and innovative, critical, discipline, honest, objective, and having high work ethic.

Developing a scientific attitude in science learning can foster interest in science. Working in the field of science based on the right philosophy can produce scientific discoveries [9]. Students who have a scientific nature will try to find out thesolution of the problem by asking questions about the objects and events. The scientific attitude consists of curiosity, respect for evidence, flexibility to new ideas (flexibility), critical reflection, and environmental sensitivity[9].

5. Conclusion

Based on research result and discussion, it can be concluded thatThe results of the unpaired t-test indicates that the significance value or Sig. (2 tailed) = 0.000 so it can be stated that there is a difference in the application of In Vitro reseach based textbook "Propagation of Pineapple Plants (*Ananascomosus L*.) Sipahutar than the one without reseach based written by Dr. Fauziyah on biology students' Scientific Attitude mastery. In other words it can be concluded that the In Vitro reseach based textbook "Propagation of Pineapple Plants (*Ananascomosus L*.) Sipahutar is effective to be applied in Contextual Learning process on Scientific Attitudes Mastery of Biology Students' outcome.

Acknowledgments

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The Effectiveness of Research Based in Vitro Textbook Application in Contextual Learning on Scientific Attitudes Mastery of Biology Students

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