
Project-Based Learning on Respiration Material in Developing Students' Habits of Mind and Concept Acquisition

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Abstract

This research aims to identify the development of habits of mind and concept acquisition through project based learning. The data acquired in this research is based on quantitative quasi experiment in which the samples are not purposely random. The design for data calculation is an equivalent control group that consists of pretest and posttest before and after the treatment in each class. The research takes place at SMAN 1 Cisarua in Eleventh Science academic year 2018/2019 with respiration system as material. The development of students' concept acquisition and habits of mind in respiration system appears to increase after the project based learning program. The result shows there are increase of concept acquisition to 59.45% and increase of habits of mind to about 42.72%. Therefore the project based learning model is increasing concept acquisition and habits of mind stated in the medium category using Gain test. One suitable learning model to implement the curriculum is a project based learning.

Keywords: habits of mind, project based learning model, concept acquisition

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INTRODUCTION

Measurement of learning outcomes that only emphasizes mastery of concepts is not wise. This causes students to be unable to develop thought processes and habits contained in the subject matter being studied (Rustaman 2018). In line with this, Marzano (1992) states that the development of mental habits is more important in addition to mastering the concept and the learning process itself, because students can learn what they want or need to understand everything with their lives.

Students' mental habits can be trained by learning that builds habits of mind. Habits of mind is a pattern of intellectual behavior that leads to productive action and is a combination of many skills, attitudes and past experiences. Its role in the learning process and individual development is to help solve problems (Costa & Kallick, 2018) and can help students organize and improve strategies in managing time productively and hone their intelligence to acquire knowledge (Sriyati 2011 in Daryanes 2013)

According to Costa and Kallick (2012) habits of mind can be associated with a person's intelligence to act. Rustaman (2018) states that thinking habits are very important to be developed at various levels and instilled from an early age, and implemented through learning the field of study. Habits of mind skills and mastery of concepts can be trained, developed and improved through a learning model. Strategies to help develop habits of mind is to include it in the learning model (Leager in Sustainable 2015). According to Dottin, educators must demonstrate a commitment to intellectual activity patterns that integrate their cognitive and social behavior (Altan, et al, 2017). The strategy to help develop the habits of mind in science is to include them in the learning model (Leager in lestari 2015).

Marzano (1993) in the dimension of learning argues that thinking habits consist of three components, namely self-regulation, critical thinking and creative thinking.

Table 1. Habits of Mind

Habits of mind	deskripsi
Self regulation	<ol style="list-style-type: none"> 1. be aware of one's own thoughts 2. make an effective plan 3. identify and use the sources of information used 4. evaluate the effectiveness of learning 5. Realize Your Own Thoughts 6. Respond appropriately to feedback
Critical thinking	<ol style="list-style-type: none"> 1. looking for an accurate answer or solution 2. able to express arguments clearly based on valid references 3. open Thinking 4. be sensitive and know the abilities of his friends 5. able to take a stand supported by broad insight
Creative thinking	<ol style="list-style-type: none"> 1. can get involved in a task even if the solution is not immediately apparent 2. make an effort to maximize your ability 3. generate ideas or solutions that are different from existing ones 4. create, use, improve and evaluate what he made himself

Marzano (1993)

In fact, teachers still use the old way of teaching, namely teacher-centered or teacher-centered teaching. Arnyana (2004) in Sudirgayasa (2014) states that learning biology in the classroom emphasizes more on the aspect of providing information and only academic

achievement to be achieved. This results in students' understanding that studying biology has nothing to do with problems in everyday life, studying biology is only for taking tests or exams.

The teacher encountered problems in the form of some students who had good intellectual intelligence, but lacked attitude. Some students

are good at explaining concepts, smart in math, but less able to communicate and cooperate with their friends, lack empathy and easily give up if they encounter difficulties (Nurmaulita, 2014). educators must demonstrate a commitment to patterns of intellectual activity that integrate their cognitive and social behavior (Altan, Lane, & Dottin, 2017).

Conditions in the field indicate that teachers' understanding of the implementation of the learning model recommended in the 2013 curriculum is still lacking. Students are passive only as listeners, interactions in class follow the teacher, as a result students are not accustomed to thinking about solving problems, making plans and deciding a problem.

The author's initial observations and interviews with Biology teachers at SMAN 1 Cisarua, Bogor Regency, biology learning is carried out in general, the teacher delivers the material, with lecture and question and answer methods still dominating. The learning model that has been carried out is only limited to trying without doing any follow-up. The evaluation of biology learning by teachers tends to be in the domain of concepts, so student learning outcomes are often unsatisfactory. Students have not been able to relate biological material in everyday life.

Based on the description of the problem above, it is necessary to improve the learning process. To improve students' thinking ability, students must be given the opportunity to be involved in learning, build and demonstrate their skills and measure their abilities. It is very important for students to do their best in starting a project even if the results are not immediately visible. Students can build Habits of Mind that can improve their best ability to be able to solve challenging problems (Kallick & Zmuda 2017).

The use of project-based learning models can be the solution. This model is very supportive to train students' thinking processes, the stages of the project-based learning model can build habits of mind or thinking habits. This learning can help improve logical thinking, develop students' creative abilities and encourage students to do scientific research work (Isabekov & Sadyrova, 2018). In line with the opinion of Savin-Baden & Major, in Anazifa (2017) (students who participate in project based learning have the opportunity to build their knowledge, compare, choose the right information in learning experiences.

Project Based Learning (PjBL) is a learning method that uses projects or activities as media. Learners conduct exploration, assessment, interpretation, synthesis and information to produce various forms of learning outcomes. This learning uses problems as the first step in collecting and integrating new knowledge based on experience in real activities (Kemdikbud, 2015).

Research that uses a project-based model was carried out by Dwi Lestari (2015), and the results of the research are an effective project-based learning model for building habits of mind characteristics, and increasing student activity. According to Husamah (2015) the blended project based learning model is effective in building self-regulation, critical thinking and creative thinking in biology learning in the Biology department.

Learning is not just conveying material so that students can master the concept, but students need to be helped to build thinking habits. For this reason, the use of learning models that can improve understanding of concepts as well as support the development of the characteristics of habits of mind is something that must be done.

METHOD

The method used is a quasi-experimental quantitative, not actually random. Research design non-equivalent control group design. With this type, the study was designed with a pretest and posttest at the beginning and end of treatment in each class. The study consisted of two ability variables (Y) namely mind habits and mastery of respiratory system concepts and two treatment variables (X), namely project-based learning models. and problem-based learning models. The subjects of this study were students of class XI MIPA SMAN 1 CISARUA for the academic year 2018/2019, the number of students in each study group was 35 students. Class XI MIPA2 is the experimental class and Class XI MIPA3 is the control class.

The research procedure is the application of the project-based learning model in the experimental class and problem-based learning in the control class. The research implementation begins with identifying potentials and problems and collecting data. The data obtained is used as a further study to be developed in a learning implementation plan. The habits of mind indicator used in this study is habits of mind

according to Marzano which consists of three indicators, namely self-regulation, critical thinking and creative thinking, which are then used as the basis for making a habits questionnaire. of mind (HoM).

The instrument used is an observation sheet on the implementation of learning, the habits of mind instrument in the form of a questionnaire of habits of mind and mastery of the concept in the form of multiple choice questions designed and tested for validation and reliability. The data collected in this study are: a) the implementation of learning, b) the value of students' concept mastery, c) the value of students' habits of mind d) the student's response to problem-based learning. Analysis of the data used includes analysis of validation of mastery of concepts and questionnaires of habits of mind by experts.

RESULT AND DISCUSSION

Based on the post-tests that were given to the This study aims to identify improving habits of mind and improving students' conceptual skills by using a project based learning model. The application of the project based learning model in this study generally shows positive results when viewed from the analysis of several instruments. Project based learning approach affected academic achievement in positive way,that is learning permanence.

The results of observations made by observers during the learning process showed

that almost the entire learning process was carried out well. So that from the implementation, it can be achieved an increase in students' habits of mind and mastery of the concept of the respiratory system material.

Project-based learning or project-based learning is a learning model that organizes classes in a project (Thomas, 2000 pp. 1 in Afriana 2015). The stages of project based learning that are used as a reference in this research are PjBL developed by The George Lucas Education Foundation and PjBL Syntax Doppet (Kemdikbud 2014, p 34).

Student activities in PjBl learning make students motivated to actively find their own information from sharing sources, interact with each other to find solutions to real-world problems given as assignments. Through problems students can improve their cognitive abilities starting from analyzing, synthesizing, evaluating and creating. This learning model also trains students to think critically to generate creative ideas to realize a product.

Based on student response questionnaire data, 91.4% of students gave positive responses to the implementation of PjBL. The measurement of students' conceptual mastery ability was obtained through pretest and posttest activities in both the experimental class and the control class. The experimental class was treated with the PjBL model and the control class received the PBL treatment. The pretest activities carried out before the treatment and the posttest after the treatment produced data in the form of increasing students' mastery of concepts.

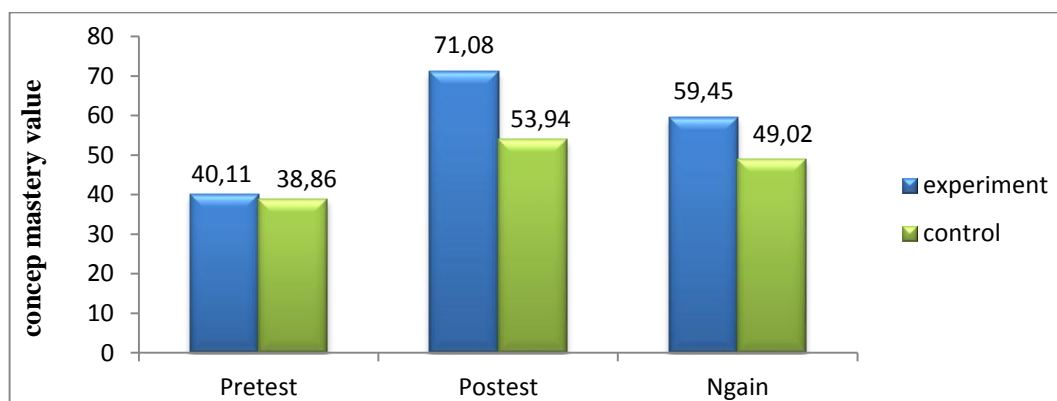


Figure 1. Average Pretest, Posttest and N gain Concept Mastery

The results of the calculation of the N-gain score test obtained the experimental class N-gain value of 0.59 and the control class N-gain value of 0.49. Based on the N-gain criteria according to Hake, both the experimental class and the control

class both have n-gain values in the medium category. However, for the category of interpretation of the effectiveness of the experimental class N-gain of 59.45% is quite

effective, while for the control class with an N-gain value of 49.03% it is less effective.

The results of the N-gain score data analysis showed that the increase in students' conceptual mastery facilitated by the PBL model was higher than the concept mastery in the PBL-facilitated class. The difference in treatment in the two classes produced different results. Mastery of concepts in the experimental class with the PjBL learning model is effective in increasing students' mastery of concepts while the control class is less effective in increasing mastery of concepts.

The results of the calculation of the habits of mind questionnaire in the experimental class obtained an N-gain value of 50.67% for the self-regulation indicator. The critical thinking and creative thinking indicators each get N-gain scores of 43.4% and 34.11%, the three indicators have moderate criteria. Calculation of the N-gain

score for the control class obtained an N-gain value of 34.9% for the moderate category of self-regulation indicators. The indicators for critical thinking and creative thinking in the control class each get an N-gain value of 7.7% and 26.43%, both of which have low criteria.

Judging from the N-gain value on each indicator the increase in habits of mind in the experimental class was higher than the increase in habits of mind in the control class. The N-gain value in the experimental class with the project based learning model has an increase with moderate criteria on the three indicators. In the control class with the problem based learning model, it shows an increase with moderate criteria only on the self-regulation indicator, while the critical thinking and creative thinking indicators have low gain criteria.

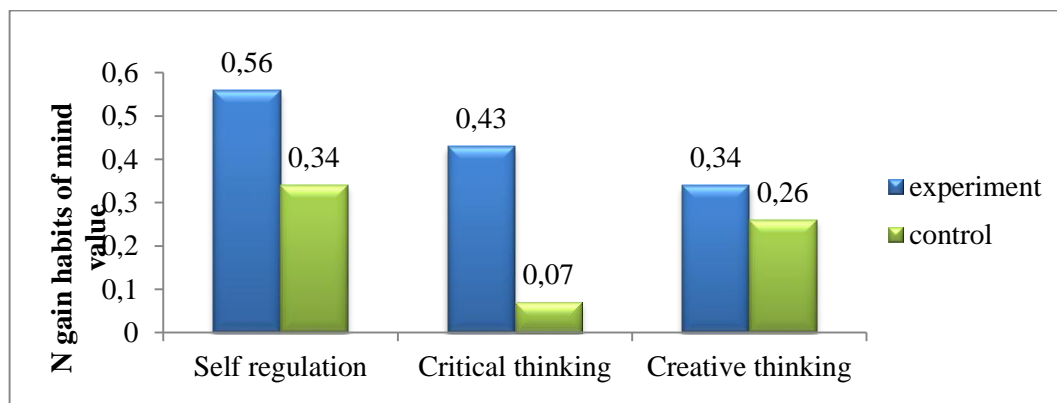


Figure 2. Average N-Gain Habits of Mind for Experiment class and Control class

Based on the interpretation of the effectiveness of N-gain according to Hake, the project based learning model is quite effective in improving students' habits of mind on self-regulation indicators only, while critical thinking and creative thinking indicators are less effective. While in the control class all indicators of habits of mind are less effective in increasing students' habits of mind.

There was no increase in habits of mind in the high category and the effectiveness of N-Gain in the effective category because the research took place in 4 meetings. The duration of time is not enough to increase the habits of mind in the high and effective category. Because new habits can be formed through activities that are repeated over a long period of time. According to Costa and Kallick (2012) time is something that greatly

affects habits of mind. So it can be said that this research is the first step of students' habits of mind and has a tendency to increase. The tendency to increase habits of mind can be seen from the difference between habit of mind before treatment and habits of mind after treatment. By using the Sample Paired Test or the paired sample test from the calculation results (table 4), the sig value is obtained. 0.000 for the experimental class and 0.002 for the control class. So it can be said that there are differences in habits of mind before and after treatment, both in the experimental class and in the control class.

	N	Korelasi	signifikansi	description
Initial HoM – late HoM	35	0,592	0,005	Medium, substantial relationship

The magnitude of the relationship between the initial HoM and the late HoM can be determined by using the correlation test. The

results of the calculation show that the correlation between the initial hom and the final hom is 0.592. Based on the range of correlation values according to Young, 0.592 is in the medium category with a substantial degree of relationship. So it can be said that there is a substantial relationship between the initial HoM and the late HoM.

Table 2. Regression Significant

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1152.057	1	1152.057	13.724	.001 ^b
	Residual	2770.229	33	83.946		
	Total	3922.286	34			

From the table it is known that the calculated F value = 13,724 with a significance level of $0.01 < 0.05$, it can be said that there is an influence of the X variable (habits of mind) with the Y variable (concept mastery).

Table 3. Analysis of Coefficient Correlation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2151	.542 ^a	.294	.272	9.16222

The calculation results are shown in table 3, the correlation value is 0.542 which means that there is a relationship between habits of mind and students' conceptual abilities. This means that the higher the students' habits of mind, the higher the

mastery of the concept. The coefficient of 0.294 is a factor of student habits of mind that contributes 29.4% to the mastery of concepts.

Table 4. Test Results of Initial T HoM and End HoM Experiment Class

	T hit	df	sig	keterangan
Initial HoM awal – late HoM eksperimen class	-5,119	34	0,000	There is a difference between HOM before pjbl and after pjbl
Initial HoM awal – late HoM control class	-5,119	34	0,002	Terdapat perbedaan antara HOM sebelum Pjbl dan sebelum Pjbl

Information; reject Ho and accept H1 if the probability of significance ≤ 0.05

CONCLUSION

There is an increase in mastery of concepts and habits of mind in the classroom with the project-based learning model in the medium category. Time is something that greatly affects habits of mind because new habits can be formed through repeated activities over a long period of

time. So it can be said that this research is the first step of students' habits of mind and has a tendency to increase.

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