Implementation of Problem Based Learning (PBL) Model to Improve SMP Students' Concepts Mastery in Additive Materials and its Correlation with Surat Al Baqarah Verse 168

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ABSTRACT

Background. The aim of this research is to describe the implementation of learning, describe the increase in Santri's mastery of concepts, and describe the Santri's response after applying the Problem Based Learning learning model to the additive sub-material.

Purpose. A pre-experimental design with One Group Pretest- Posttest Design is used in this type of research. The research subjects used were students from a private junior high school in Trenggalek.

Method. This research uses several instruments in the form of learning implementation observation sheets, test sheets, and questionnaires which are then analyzed using quantitative descriptive.

Results. The research results show that the implementation of learning achieved very good criteria with mode 4. Normality test, paired t-test, N-Gain were used in research data analysis. The standard test results obtained a significant value of 0.122, which means the data is normally distributed. The paired t-test produces a Sig value. amounting to 0.000 < 0.05, which means there is a significant difference after being given treatment in the form of the Problem Based Learning Model. The increase in students' mastery of concepts can also be seen from the N-Gain results with an average score of 0.87 (high).

Conclusion. The students gave a positive response to the application of this learning model by obtaining an average score of 93.81% and the criteria were very high. These results show that Santri's mastery of concepts can increase after implementing the Problem Based Learning Model.

KEYWORDS

Additives, Mastery of Concepts, Problem Based Learning

INTRODUCTION

The learning process is all planned activities with an effort to teach students to achieve the expected goals (Junaedi, 2019). The crucial thing in education is the need for balance between learning processes and outcomes. This balance can be achieved if a teacher can carry out his duties optimally. The component in education that has a very important role is the curriculum (Rusnawati, 2020) because the curriculum is a guide for implementing learning and one of the media for achieving educational goals.

Now the 2013 curriculum applies which requires students to be active during learning. Apart from that, with the 2013 curriculum it is hoped that students will have the best competencies in terms of attitudes, skills or knowledge so that they are able to face an era that continues to develop (Salim, 2020).

In the teaching and learning process, students play an active role in efforts to discover knowledge, concepts, theories and conclusions, not an effort to collect information or facts. In order for this process to be carried out, the role of the teacher is needed as a director of teaching and learning activities so that students not only gain knowledge but are also able to build knowledge for themselves, so that learning is student-centered, not teacher-centered. Science learning aims to help students master a number of science facts and concepts and can develop and instill a scientific attitude in their interactions with the social environment. In order for this goal to be achieved, science needs to be taught in the right way and can involve students actively and the right learning model needs to be applied (Muhtadin et al., 2023).

Facts on the ground show that the role of teachers is still more dominant than that of students. This is not in accordance with the statement described above. Learning activities like this also occur at Hasan Munahir Middle School, where learning is still teacher-centered. Teachers often use a presentation learning model which causes students to tend to be passive and not used to developing their own knowledge. students who tend to be passive can be seen from the students' responses when the teacher teaches in class, namely:

1. Santri tend to only hear explanations from the teacher
2. If the teacher asks questions to get a response, the students tend not to respond.
3. If the teacher gives the opportunity to ask questions, the students do not take advantage of it.
4. When the teacher asks a question, the students rarely want to answer, the students only answer when appointed.

Learning situations that are still academic (book-oriented) and teacher-centered learning will result in most students experiencing problems in the learning process, namely difficulty in mastering the concepts presented by the teacher. This results in students' learning outcomes being low and unsatisfactory.

The low level of mastery of students' concepts can be seen in the minimum completeness criteria (KKM) in the additive material of class VIII. Only 9 students reached the KKM, while there were 23 students below the KKM. The KKM set by the school for science lessons is 65. So, it can be concluded that students' mastery of the concept of additive materials at Hasan Munahir Middle School is still low.

Based on these facts, a learning model is needed that encourages class VIII students to have the ability to build their own knowledge and make students more active. In this case, learning models, teacher creativity and the environment are really needed so that students can have a really good mastery of the concepts in the material. A learning model that involves many students actively in the learning process results in students constructing their knowledge from the simplest things to the complex things. Here the role of the teacher as a facilitator in learning really has to be creative to create learning that can facilitate students to learn from the environment and their peers (I. Rahmawati et al., 2016).

One learning model that can encourage students to develop their own knowledge and make students more active and help each other in mastering material concepts to achieve maximum learning outcomes is the *Problem Based Learning (PBL)* learning model. Problem Based Learning is a learning method where students learn through problem solving on complex problems. In this model, students work together with their peers in collaborative groups to identify what they need to

learn to solve problems, which leads students to learn independently, apply their new knowledge to the problem, and reflect on what they learn. The application of Problem Based Learning can train students to construct concepts through solving given problems. In this process, students learn to share and discuss to solve the problems they face (Novitasari, 2015).

Problem Based Learning (PBL) is learning that is delivered by presenting a problem, asking questions, facilitating investigations, and opening dialogue. The problems studied should be contextual problems encountered by students in everyday life. Meanwhile, concept mastery is the students' ability to understand scientific meaning, both theory and its application in everyday life. In other words, concept mastery is the ability for students to master the material studied in real life (H. . Rahmawati & S.W.S, 2020).

The Problem-Based Learning (PBL) learning model has several advantages, including:

1. Students are involved in learning activities so that their knowledge is really well absorbed.
2. Santri are trained to be able to work together with other santri
3. Students can obtain problem solutions from various sources.
4. Students are encouraged to have the ability to solve problems in real situations.
5. Students have the ability to build their own knowledge through learning activities.
6. Learning focuses on problems so that unrelated material does not need to be studied by students at that time. This reduces the burden on students to memorize or retain information.
7. Scientific activities occur among students through group work.
8. Students are accustomed to using knowledge sources from libraries, the internet, interviews and observations (Masrinah et al., 2019).

Based on the description above, it is necessary to conduct research on the influence of the Problem-Based Learning (PBL) model on the mastery of science concepts regarding additive materials in class VIII students at Hasan Munahir Middle School. With this research, it is hoped that it will motivate students to be more active and able to build their own knowledge so that they will master concepts to the maximum so that students will also get maximum learning results.

RESEARCH METHODOLOGY

This research uses a pre-experimental type. The research design uses "One group pretest-posttest design" (Sugiyono, 2016) where the subject is only 1 class without a control class as follows:

O1 X O2

    O1   = Santri Pretest before studying
    X   = Use of the PBL learning model
    O2   = Posttest students after learning

The research subjects were directed at a private junior high school in Trenggalek with a total of 32 students in class VIII-A.

This research uses several instruments:

1. Learning Implementation Observation Sheet
   The observation sheet is a data collection instrument by means of the researcher directly observing the subject to be studied. In this research, an observation sheet on the implementation of the RPP will be used which will be filled in by the science subject teacher as the observer.
2. Test Sheet
   The test consists of questions in the form of descriptions with a total of 5 description questions to determine the students' mastery of the concept of additives. The questions given are about science material that students have studied and their validity and reliability have been tested.

The pretest is carried out at the beginning of learning, while the learning outcomes test (posttest) is obtained at the end of the meeting which is held after implementing the Problem Based Learning (PBL) learning model.

3. Questionnaire Sheet

This sheet contains several components in the form of a title, instructions for filling in, and a table in which there are numbers, 15 statements, and statements of strongly disagree, disagree, agree, and strongly agree which are filled in by the students. Students fill in by marking the checklist. This sheet is useful for knowing the students' responses after implementing the PBL model.

Data collection methods used include:

1. Observation is needed to find out the teacher's activities.
2. Test to determine the increase in students' mastery of concepts.
3. Questionnaire or questionnaire method to obtain student reactions after implementing this model.

The data analysis technique used is as follows:

1. Analysis of Learning Implementation

In the implementation sheet instrument for the implementation plan for the PBL learning model, data was obtained about the teacher's activities during the lesson. The data obtained from the observation sheet is in the form of observer assessment results in the form of assessment scores which are then analyzed by determining the mode for each aspect based on the learning implementation criteria. Mode is data that is frequently seen or has the highest frequency based on observations obtained (Hidayati et al., 2019)

The following is a table of learning implementation criteria:

Table 1. Learning Implementation Criteria

Score	Criteria
4	Very good
3	Good
2	Enaogh
1	Not good

2. Test data for assessing students' mastery of concepts

1) Normality Test

This test is useful for finding out whether the data is normally distributed or not and one of them can be using the *Kolmogorov Smirnov Test* (Majdi et al., 2018). Research data is said to be normal if the significance value is > 0.05 and research data is said to be abnormal if the significance value is < 0.05 (Sulaiman, 2006). This data analysis technique uses SPSS 25.

2) Paired t-test (paired t-test)

The paired t test is a hypothesis testing method where the data used is paired. This test is useful for finding out the average difference between two variables. The t-pair test was tested using SPSS 25 based on decision making, namely H0 if the significance value was > 0.05, and H0 was not accepted if the significance value was < 0.05 (Trihendradi, 2009)

3) N-Gain

N-Gain (normalized gain) is used to measure the increase in students' critical thinking abilities before and after implementing the structured inquiry model (Sugiyono, 2017). Here is the N-Gain formula:

N- Gain = x 100% $\dfrac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretest\ Score}$

The following is a table of normalized Gain criteria:

Table 2. Normalized Gain Criteria

Normalized Profit Value	Interpretation
0.70≤N-Gain ≤1.00	High
0.30≤N-Gain < 0.70	Medium
0.00 < N-Gain < 0.30	Low
N-Gain = 0.00	No Gain
-1.00≤ N-Gain<0.00	A Decline Occurs

3. Questionnaire Data

A score is given for each number of questionnaires that have been created by racing on the following Likert scale:

Table 3. Likert Scale Assessment

Answer	Score
Strongly agree(SS)	4
Agree(S)	3
Disagree(TS)	2
Strongly disagree (STS	1

The student response data was then analyzed by calculating the percentage of student responses to each statement (Majdi et al., 2018) which was conveyed using the formula:

Percentage = x 100% $\dfrac{Number\ of\ values\ obtained}{Maximum\ value}$

The following are the answer criteria for each student:

Table 4. Response Criteria on the Questionnaire

Response	Criteria
85%≤ Response	Very High
70% ≤ Response < 85%	High
50% ≤ Response < 70%	Not High
Response <50%	Less High

RESULT AND DISCUSSION

This research resulted in: (1) Implementation of the PBL model; (2) Increased mastery of concepts; (3) Student responses after implementing the PBL learning model. The implementation of the learning model used was observed by 3 observers. The PBL learning model has 5 learning syntaxes as follows: (1) Orienting students to the problem; (2) Organizing students to learn; (3) Assisting independent and group investigations; (4) Develop and present work results; (5) Analyze and evaluate the problem solving process. The results of the observation of learning implementation are used to describe the teacher's ability to manage learning. Assessment of the syntax implementation of the PBL learning model uses a value range from 1-4. The results of the research

show that the application of the PBL model to additive material from meeting I to meeting III has mode 4 which is categorized as very good according to the PBL phase or syntax, so it can be stated that the application of PBL to additive material is very good. During the learning process, the teacher functions to facilitate the students. A study states that in implementing this model the teacher has a role to facilitate the students, while the students must be active (Bogar, 2018).

According to a study, teachers agree that active interaction is very important and online learning cannot replace it (Niemi & Kousa, 2020). Increased mastery of students' concepts can be seen by analyzing data using the normality test, paired t-test, and calculating the N-Gain score which is analyzed based on the results of the students' pretest and posttest. Following are the results of the normality test:

Table 5. Results of the One Sample Kolmogorov-Smirnov Normality Test

N (Number of Students)	*Asimp. Sig (2-tailed)*
36	0,122

Table 5 shows that the normality test using SPSS 25 gets an Asymp value. Sig is $0.122 > 0.05$. The results showed that the data was normally distributed. After that, a paired t-test was carried out with the Sig value results. amounting to $0.000 < 0.05$, so it can be seen that there is a significant difference between the students' concept mastery scores before and after implementing this model. Increased critical thinking skills can also be seen based on the N-Gain score results. Based on the results of data analysis, it is known that the average percentage of N-Gain is 0.87 which is included in the high category. This proves that the application of the PBL model can improve students' mastery of concepts.

The students' responses during learning using this model can be seen from the questionnaire filled out by the students. The results of the students' responses from the 15 statements that were made produced the following percentages:

Table 6. Recapitulation of Student Response Results

Quest Number	*Percentage (%)*
1	92,30
2	93,75
3	91,60
4	93,75
5	87,60
6	93,05
7	88,88
8	95,83
9	97,91
10	96,52
11	95,13
12	90,97
13	95,83
14	95,13
15	99,30
Average	93,81

The lowest response was 87.60%, which had very high criteria, namely in statement number 5. The highest response was 99.30%, which had very high criteria, namely in statement number 15. The overall result was that the average response percentage was 93.81%, which had the criteria very high. Based on these results, the student response to the learning model applied was very high.

An additive is a material that is added to food or drink intentionally in small amounts (Fallis, 2013). Food additives are not the main ingredients of food, but are compounds that are deliberately added to food which are involved in processing, packaging and storage. Based on their origin, additives are divided into two types, namely natural additives and artificial additives.

1. Natural additives are substances that are deliberately added to food or drinks whose ingredients come from nature or living creatures.
2. Artificial additives are substances that are deliberately added to food or drinks whose ingredients are made from chemicals by making the substances through a chemical reaction process.

Processed food or prepared food is very easy to find nowadays. Either homemade food, or factory processed food (packaged, canned). It is possible that the food that is often found in it contains ingredients that are deliberately added to obtain high quality food with a good appearance. Ingredients that are deliberately added to food function as colorings, preservatives, flavor enhancers, sweeteners, thickeners, aroma enhancers, etc. Apart from having the benefits as mentioned, additives also have a negative impact on human health. Nowadays, it is rare to find food ingredients that do not contain additives in them. Either in the form of flavorings, colorings, sweeteners, preservatives, or in other forms. Excessive use of additional ingredients (additives) will cause bad consequences for health. In processed foods, almost all of them contain additives in the form of preservatives. Preservatives used as additional ingredients in processed foods have a detrimental impact on the health of humans who consume them either in the long term or in the short term. The impact can be in the form of an increased risk of abnormal metabolism, abnormal death rates, abnormal births. Foods that contain additives in excessive amounts, meaning that they are not used wisely, can cause various health problems such as nerve, liver, kidney damage, poisoning, birth defects, convulsions, growth abnormalities, foot anomalies, infertility, and even death. If food containing additional ingredients (additives) is consumed continuously, it will cause dangerous threats such as poisoning of the central nervous system, growth disorders, cancer, foot anomalies, bleeding in several parts of the body, liver and kidney damage, infertility. , convulsions, birth defects, severe gastroenteritis disorders, even death. Poisoning caused by boric acid (borax) includes symptoms of coughing, vomiting, and irritation of the eyes and mouth (Emilia et al., 2020).

The use of additives cannot be avoided because their function is needed in food production. Excessive use of additional ingredients (additives) in food has a negative impact on health. Therefore, the use of additional materials (additives) must be wise so as to minimize negative impacts. The additional ingredients (additives) that are widely used among other additives (additives) are in the form of flavoring ingredients or often known as MSG (Monosodium Glutamate) or MSG. This type of additive can cause various impacts on human health, such as severe dizziness and nausea, stronger heart palpitations, and also tingling. There are toxic properties caused by the causative ingredients, one of which is its nature as a neurotoxin (Yamin, 2020).

Apart from flavoring ingredients, there are other additives, namely sweeteners. Sweeteners that are quite well-known and often used as substitutes for cane sugar are saccharin and cyclamate. Saccharin has a sweet taste of around 300 times the sweetness of cane sugar, while Cyclamate has a sweet taste of around 30 times the sweetness of cane sugar (Andriyani et al., 2019). The results of

the research show that food ingredients containing the sweetener Cyclamate cause bladder cancer. Apart from causing bladder cancer, these sweeteners cause various other diseases. Such as heart disease, diabetes, chromosome damage, cell death, disrupting the blood clotting process, and tumors in the kidneys, ovaries, lungs, uterus and skin (Aritia & Suyanto, 2019).

Factory processed foods (packaged foods) are often found nowadays. Factory processed food (packaged food) has a long shelf life. For days, weeks, even years because the food contains additional ingredients (additives) in the form of preservatives in it. Apart from additional ingredients (additives) in the form of preservatives, usually factory-processed food (packaged food) also contains additional ingredients (additives) in the form of coloring agents. Preservatives used by humans in various types have an impact on health both in the short term and in the long term, for example increasing the risk of abnormal metabolism, such as disrupting blood circulation mechanisms, for example inhibiting the absorption of vitamin K which will later affect the blood clotting process, inhibiting respiration even stops the activity of cells, tissues, organs because the mitochondrial surface closes, causing paralysis or even death, increased abnormal births, and abnormal death rates (Tammu, 2018).

The additive material has a correlation with QS. Al-Baqarah verse 168. The verse reads:

يَٰٓأَيُّهَا النَّاسُ كُلُوْا مِمَّا فِى الْأَرْضِ حَلَٰلًا طَيِّبًاۖ وَّلَا تَتَّبِعُوْا خُطُوٰتِ الشَّيْطٰنِۗ اِنَّهٗ لَكُمْ عَدُوٌّ مُّبِيْنٌ

O people! Eat of the halal and good (food) found on earth, and do not follow the steps of Satan. Indeed, Satan is a real enemy for you (QS. Al-Baqarah: 168).

This verse explains that Allah commands humans to eat the best halal food for His people. But humans are often careless and follow their desires. Nowadays, human lifestyle tends to be consumerist, instant, easy and, most importantly, delicious to the taste of the tongue without thinking about the bad effects that will arise from these wrong habits. Without realizing it, delicious food is enjoyed, ultimately damaging the body with various diseases that attack it. One of the reasons why food is delicious and interesting to eat is the additives added to the food. As Muslims, we must eat halal and good food according to the QS. Al-Baqarah verse 168. We should not eat food that contains many artificial additives which can cause various kinds of diseases that can be dangerous (Alindah, 2017)

CONCLUSION

Based on the results of research and discussion, the implementation of the PBL learning model can be implemented very well. This is based on the results of the assessment of learning implementation by obtaining mode 4 and having very good criteria. Santri also experienced an increase in mastery of material concepts. This is proven by the results of the paired t-test and N-Gain. The students' response to the application of the PBL learning model obtained an average score of 93.81% with very high criteria.

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AUTHORS' CONTRIBUTION
Author 1: Conceptualization; Project administration; Data curation; In-vestigation; Validation; Writing.

Author 2: Writing; review; editing; translation

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