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# Implementation of Problem Based Learning By Using Authentic Assessment to Improve Students' Activity and The Ability of The Students to Solve Problem

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**Abstrak:** The learning process of Mathematic in a conventional way took place in classroom was dominated by a teacher and gave less opportunity for the students to be more active in the learning process. Problem Based Learning by using Authentic Assessment is one of the alternatives to improve students' activity in solving problems. This is a classroom action research. This research is focused on the improvement of students in problem solving; and improve the students' activity. The instrument in this research consists of test in solving problem in Equation and Quadratic Function. Data Processing is done to find out the improvement of problem solving ability, students' activity and teachers' ability in managing teaching learning process. The result of the research shows: (1) The application of problem based learning by using authentic assessment improves the problem solving ability of mathematics. On 1st cycle, it is found 62.5% from the students has the ability of problem solving in the average of moderate. On 2nd cycle 85% of the students gets the average of moderate. (2) It is concluded that the students' problem solving ability and the level of students' activity are improve.

**Keywords:** *Problem Based Learning, Authentic Assessment, Students Activity, Problem Solving Ability*

## 1. INTRODUCTION

The development of science and technology has opened ways for new inventions in science and along with the improvement in science and technology itself. For that reason, the problems in society are also getting complex caused by negative or positive impacts of the new invention. To overcome the problem, reliable human resources are needed to handle the improvement by using the knowledge they have.

Education is the only solution to create reliable human resources, smart, and have high morality that supposed to be able to apply his/her knowledge for human welfare. For that reason, human beings must get appropriate education in order to be his/her asset for his/her future.

According to Ausebel (Darsono, 2017) Studying is an assimilation process of the knowledge being learned and the knowledge achieved before, while Gagne (Dimiyati, Mujiono, 2006) stated that studying is capability and after studying humans achieve skills, knowledge, attitude and value.

Silaen (2016) said, learning is a process carried out by a person in order to obtain a new behavior change as a whole, which is obtained from the results of his own experience in interacting with the surrounding environment. From some of the definitions above, it can be concluded that learning is an activity to obtain a change in behavior by obtaining new information through experience. In order to improve learning quality experts suggested the use of constructivist learning for the teaching learning process in classroom. The use of this learning paradigm is to change the teachers center becomes students center. So, during the process teacher should create a situation in which the classroom can make the students study, and drive the students to learn and have opportunity tobe active in constructing concepts they learned.

Based on those definitions, studying is a transformation of attitude as a result of experiences passed by humans and assimilated the experiences with the knowledge achieved before that becomes skills, knowledge, attitude and value

PBL is an innovative learning that drives the students to be active. PBL involved the students to find solution of problems through some steps of scientific method. By getting the student get used to scientific

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methods make the students able to learn knowledge related to the problem and also some skills to overcome the problem.

According to Nurhadi and Senduk (2013) the Problem Based Instruction (PBI) learning model is a learning model that uses real problems as a context for learning about critical thinking and problem-solving skills, as well as for acquiring essential knowledge and concepts from the material being studied.

Problem-based learning is a learning approach by oriented students to contextual problems, which encourages students to be able to find the problem, examine the quantity, quality and complexity of the problems raised (Rusman, 2015).

Authentic investigation as also the characteristic of PBL means students should analyzed and identified problems, making hypothesis and prediction, collecting and analyzed information, making inference and conclusions. The last characteristic of PBL is collaboration means during the learning process students should works in team or group.

According to Hayat (2014) authentic assessment is a process of collecting information by teachers about the improvement and achievement in learning process or to show exactly whether the purpose of the learning has been accomplished or achieved. According to American Library Ascociation, authentic assessment is a scoring that shows the process of learning. Portfolio assessment is including into authentic assessment in which students are asked to shows the tasks dealing with daily live that represent the application of skills and knowledge.

There are several elements to consider that make an assessment more "authentic" (Ashford-Rowe, 2014; Grant, 2021; Wilson-Mah, 2019), including:

**Accuracy and validity** – The accuracy of the assessment refers to how closely it resembles a real-world situation, problem, disciplinary norm, or field of study. The assessment validity refers to the alignment of grading criteria to the learning objectives, transferable skills (e.g., communication, critical thinking, etc.), workforce readiness skills, and disciplinary norms and practices.

**Demonstration of learning** – The outcomes of an assessment should allow students to demonstrate learning in ways that reflect their field of study, for example, a performance or a product that is authentic to their future career. Or the assessment should allow for student choice based on interests and skills; for example, one group of students decides to create a podcast to demonstrate their learning in general education coursework.

**Transfer of knowledge** – The assessment should provide the transfer of knowledge from theory to practice and from one task or experience to another. For example, students writing a blog post about a scientific principle that was demonstrated in current events replacing a traditional essay or paper on the scientific principle.

**Metacognition** – The process of reflecting on learning should be purposefully planned for students to make connections to prior knowledge, experiences, and different subject areas. For example, metacognition can be encouraged in authentic assessments by asking students to evaluate their progress, self-assess their product or performance, and reflect on their thought processes and learning experiences during the authentic assessment.

Based on the above problems, it is necessary to improve the learning process through efforts to select appropriate and innovative learning models in learning mathematics at school is a very important requirement to improve students' problem-solving abilities and student activities. One of the learning model that is thought to increase student activity and problem-solving abilities is a problem-based learning model using authentic assessment.

Problem Based Learning has characteristics such as (Tan, 2013; Wee & Kek, 2002); learning begins with giving problems, problems have context with the real world, students in groups actively formulate problems and identify gaps with respect to above problems, it can be emphasized that process improvement efforts learning through efforts to select appropriate and innovative learning models in learning mathematics in elementary school is a requirement that very important thing to do. One of the learning models that is suspected to be used to improve the quality of the process and learning outcomes is a model Problem Based Learning (PBM). Problem Based Learning has characteristics such as (Tan, 2003; Wee & Kek, 2002); learning begins with giving problems, problems have context with the real world, students in groups actively formulate problems and identify gaps. So, the purpose of this research is to improve the learning process through efforts to select appropriate and

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innovative learning models in learning mathematics at school because it is a very important requirement to improve students' problem-solving abilities and student activities.

## 2. METHOD

The research is conducted at SMA Husni Thamrin Medan. The research is conducted in the first semester of 2022/2023. The population of this research is all the students of 10th grade of SMA Husni Thamrin Medan. The sample of the research is 35 the students of the 10th grade from A class of SMA Husni Thamrin Medan. Based on the problem to be studied, the research is using classroom action research in order to improve the process and the result of learning in classroom by applying PBL. In order to collect data the researcher in this research is taking the data from a direct observation. As instruments of collecting data the researcher is using 2 kinds of test: 1) Problem Solving Test, this test is used to measure level of understanding and the ability achieved by students in several knowledge. The scoring is using the method applied by Schoen and Ocmke in Utari (1993). 2) Sheets of Students' Activity Observation, these sheets cover the activity of the students from the beginning of the learning process until the teacher closed the learning process. The instrument of Collecting data is taken through the observation of the students' activity during the learning process whether it is personally or in group. 3) Sheets of Learning Organization Observation, this instrument is measuring the teacher's ability in organizing the problem based learning. This sheet includes five steps of learning; organized students to learn leading personal or group investigation, developing and presenting the finding, analyzing and evaluating process of finishing the problem in which all the problem are described as indicators.

Technique of Data Analysis, The achievement of the application of problem based learning by using authentic assessment as an effort to improve the student activity and skill to solve problem can be seen in three aspects: (1) Students' achievement of learning in a classical way (2) The achievement of the presentation in ideal time for students and teacher (3) Achievement of teacher in organizing the learning process. The data analysis of those three aspects can be listed as follows: 1). Data Analysis test in problem solving. In order to make the achievement of learning goal clear, criterion evaluation is used. It is because of the orientation is the level of student's mastery of all materials so that the score will show the student's comprehension of material learned. Comprehension ability means the percentage that shows students' mastery of material given. 2). Data Analysis of Students' Activity The observation data of teacher and students' activity is analyzed by describing the teacher and student's activity during the whole process of teaching and learning.

## 3. RESULT AND DISCUSSION

### Description of Classroom Action Research (Cycle 1)

The action in this research is the application of problembased learning by using authentic assessment. The result shows description about the application of authentic assessment as an effort to improve students' activity and their ability to solve mathematical problem. The result is shows as follows:

#### *The observation result of Students' Activity*

Observation is part of the data collection needed in research. The observation in this research is done during learning process conducted by the researcher. The observer in this case is the math teacher of 10$^{th}$ grade. Observer has part in observing all activities by the students occurred in classroom in which PBL is applied. The result is shown tabel 1.

From the 1$^{st}$ cycle data above can be stated that the level students' activities which fulfill the level of tolerance are: Listening/paying attention to teacher/other students, writing/solving problem/finding way to solve problem, discussing/asking to friends/teacher and presenting the outcome of the discussion. While the activities that can fulfill the level of tolerance are: reading/understanding problem found in students' book (LKS), Making conclusion and Irrelevant attitude during learning process.

From the data can be stated that from seven categories of students' activity there are 4 that fulfill the level of tolerance decided and 3 categories that don't fulfill the level of tolerance decided. For that reason the Cycle two is done in order to get improvement in 3 categories to get to level of tolerance.

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**Table 1.** Level of Students' Activity (Cycle 1)

| No | Category of Observation | Level Of Activity of Students per meeting | | | Average (%) | Level of Tolerance |
|---|---|---|---|---|---|---|
| | | I | II | III | | |
| 1 | Listening/paying attention to teacher/other students | 13.7 | 11.2 | 16.2 | 13.75 | 9% ≤ P ≤ 19% |
| 2 | Reading/Understanding problem found in students' book (LKS) | 18.2 | 20.7 | 17.5 | 18.80 | 5% ≤ P ≤ 15% |
| 3 | Writing/Solving Problem/Finding way to solve problem | 15.7 | 18.2 | 17.6 | 17.10 | 27% ≤ P ≤ 37% |
| 4 | Discussing/Asking to friends/teacher | 15.0 | 18.7 | 20.0 | 17.91 | 16% ≤ P ≤ 26% |
| 5 | Presenting the outcome of the discussion | 16.0 | 18.0 | 15.0 | 16.30 | 10% ≤ P ≤ 20% |
| 6 | Making conclusion | 10.0 | 11.3 | 10.0 | 10.42 | 3% ≤ P ≤ 13% |
| 7 | Irrelevant attitude during learning process | 3.0 | 2.7 | 3.0 | 2.90 | 0% ≤ P ≤ 5% |

***Test result of the ability to solve problem***

The result of test on the ability of problem solving in cycle 1 is shown in table 2.

**Table 2.** The ability of solving problem in Cycle 1

| No | Score Interval | Number of Students | Percentage (%) | Scoring Category |
|---|---|---|---|---|
| 1 | 90 – 100 | 5 | 10 | Very High |
| 2 | 80 – 89 | 10 | 20 | High |
| 3 | 65 – 79 | 19 | 38 | Moderate |
| 4 | 55 – 64 | 10 | 20 | Low |
| 5 | 0 – 54 | 6 | 12 | Very low |
| | Total | 50 | 100 | |

From the table, number of students in level of very high in problem solving is 5 or 10%, in level of high is 10 students or 20%, in moderate level there are 19 students or 38% low gets 10 students or 20% and the last there are 6 students in level of very low or 12%. From this result, students that get minimum level of moderate is 34 and below the moderate there are 16 students. Classically, the level of problem solving in cycle 1 is 68%, in order to reach ≥85%, cycle 2 is considered to be done.

***The Analysis Learning Process in Cycle 1***

**Table 3.** The Result of Learning process in Cycle 1

| No | Aspect | Achievement Criteria | Result | Further Step |
|---|---|---|---|---|
| 1 | Students' Activity | 5 of 6 categories of activity must be fulfill and the accomplishment of point b,c,d,e. | 4 categories, a,b,c,d is not accomplished | Review and continued to cycle 2 |
| 2 | Problem solving Ability | ≤80% of the students get 62 | There are 62.5% students got 62 | Continued to cycle 2 by referring to the weakness in cycle 1 |
| 3 | The sheets of students' activity | 8 of 8 groups should submit their report as scheduled | 6 group submit the report as scheduled | The cycle 2 is done by referring to the weaknes of the groups that don't submit the report |

**Description of Classroom Action Research (Cycle 2)**

The action in this phase is the continuation of cycle 1. The result is shown as follows:

***The observation result of Students' Activity***

The observation is done in two meetings which is done in presentation. The summary is in the table below:

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**Table 4.** Level of Students' Activity (Cycle 2)

| No | Category of Observation | Level Of Activity of Students per meeting | | Average (%) | Level of Tolerance |
|---|---|---|---|---|---|
| | | I | II | | |
| 1 | Listening/paying attention to teacher/other students | 15.0 | 11.25 | 13.13 | 9% ≤ P ≤ 19% |
| 2 | Reading/Understanding problem found in students' book (LKS) | 13.7 | 8.75 | 11.25 | 5% ≤ P ≤ 15% |
| 3 | Writing/Solving Problem/Finding way to solve problem | 28.7 | 30.0 | 29.38 | 27% ≤ P ≤ 37% |
| 4 | Discussing/Asking to friends/teacher | 16.2 | 21.25 | 18.75 | 16% ≤ P ≤ 26% |
| 5 | Presenting the outcome of the discussion | 16.2 | 16.25 | 16.25 | 10% ≤ P ≤ 20% |
| 6 | Making conclusion | 11.2 | 7.50 | 9.38 | 3% ≤ P ≤ 13% |
| 7 | Irrelevant attitude during learning process | 3.75 | 1.25 | 2.50 | 0% ≤ P ≤ 5% |

The table shows that 5 of the categories have been fulfilled so from the aspects of activity the research is stop on second cycle.

***Test result of the ability to solve problem***

Cycle 2 is conducted after doing some revision in the planning. The focus of the cycle is to improve the ability to solve problem in mathematics by the students. The result of test on the ability of problem solving in cycle 2 as the continuation of cycle 1 is shown in table below:

**Table 5. The ability of solving problem in Cycle 2**

| No | Score Interval | Number of Students | Percentage (%) | Scoring Category |
|---|---|---|---|---|
| 1 | 90 - 100 | 8 | 16 | Very High |
| 2 | 80 – 89 | 12 | 24 | High |
| 3 | 65 – 79 | 23 | 46 | Moderate |
| 4 | 55 – 64 | 3 | 6 | Low |
| 5 | 0 - 54 | 4 | 8 | Very low |
| | Total | 50 | 100 | |

Based on the result from cycle 1 and cycle 2, the level is increased from 68% in cycle 1 to 86% in cycle 2 while the standard to fulfill is 85%. So by this improvement the research is considered done on cycle 2.

## 4. CONCLUSION

Based on the analysis of the data and findings some conclusions are taken as follows: 1. The application of Problem Based Learning by using authentic assessment is improving the ability of the students in solving problem in mathematics after facing two cycles. In cycle I 62.5% of the students who take the test have the ability in solving problem in the level of moderate minimum. In cycle II, the number in increased up to 87.5%. 2. The application of PBL by using authentic assessment increased the activity level of the students. It can be seen from the result of the cycle I and cycle II.

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