

## Improving students' responsibility and critical thinking ability through problem-based learning using student worksheet

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### Abstract

This research aims to improve the students' responsibility and critical thinking skills. It was a classroom action research applying problem-based learning (PBL) model assisted by student worksheet. It was carried out in four stages, namely planning, action, observing, and reflecting. This research was conducted in 2 cycles, involving 32 students of class VIIB of SMP N 1 Bantul. The success indicator of this research is 70% with high criteria. The findings of this study indicate that the level of critical thinking skills in class VIIB students is still low, as evidenced by the results of the critical thinking ability pretest in the first cycle, which is only 22% and 44% of the responsible attitude questionnaire test with high criteria, so it needs to be improved. The results of the posttest test of critical thinking skills in the first cycle after the action resulted in 56% and 71% in the second cycle with high criteria. Meanwhile, the results of the post-test questionnaire filling in the first cycle resulted in 59% and 75% in the second cycle with high criteria. These results indicate that the PBL model assisted by student worksheet can improve the students' critical thinking skills and responsibility in class VIIB SMPN 1 Bantul.

**Keywords:** critical thinking ability, mathematics learning, problem-based learning, students' responsibility

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### INTRODUCTION

Education is a primary need for everyone, education is based on Pancasila and the 1945 Constitution so it also prioritizes aspects of character education to face learning in the 21st century. 21<sup>st</sup>-century learning according to Salmia (2021:83) is learning that integrates mastery of technology, knowledge, skills, and communication. So that in the 21<sup>st</sup>-century learning is learning that is associated with contextual real life and can apply it according to the relevance of the real world. 21<sup>st</sup>-century learning is fluctuating so that students can keep up with the times and can benefit from the 2013 curriculum that is by 21<sup>st</sup>-century learning.

Richardo (2016) states that the 2013 curriculum is a curriculum that is rich in interests, inspiration, challenges, fun, and interactivity so that it can encourage students to be active during learning, and provide space to manage their learning management. In line with the 2013 curriculum, mathematics is one of the compulsory subjects at the SMP/MTs/equivalent level. Through learning mathematics, students can apply mathematical concepts associated with real-life problems.

Learning mathematics requires 21<sup>st</sup>-century skills as a challenge that must be faced in the learning process. Christina (2016: 222) argues that every student is required to develop critical thinking skills so that they are ready to face various problems in the real world. So that if students are accustomed to digging for information, students will be trained to think critically to overcome solutions to any existing problems.

Indonesian education is also actively participating in the Program for International Student Assessment (PISA), which is an international study in the field of education organized by the Organization for Economic Co-operation and Development (OECD) so that it can know the development of education compared to other countries. According to the results of the OECD

(2018), the results of a survey of Indonesian students in mathematics, reading, and science stated that only 28% of Indonesian students reached level 2 in mathematics. Indonesian students have the basic ability to infer and recognize, even without direct instruction, mathematical representations of simple situations (e.g. they can calculate the total travel time for two different routes to convert prices from one currency to another). In 2017, the percentage of 15-year-olds demonstrating proficiency in mathematics ranged from 2% in Zambia to 98% in Beijing, Shanghai, Jiangsu, and Zhejiang (China). In OECD countries, 76% of students achieve Level 2 learning in mathematics.

Through the results of the PISA, the researcher made observations for class VIIB at SMPN 1 Bantul around December 2021. The results of the observations included the achievement index for mathematics subjects that was quite good, as evidenced by the ranking of 1st Semester Final Assessment for achievements throughout Bantul Regency in the 2021 academic year. /2022 with an average score of 65.69. However, when the researchers gave a critical thinking ability test with questions about the material description of rectangles and triangles, only 22% of students had critical thinking skills with high criteria. The next observation was when the researcher conducted interviews with the civil servant teacher, namely about the impact of blended learning on the affective attitude of responsibility when learning mathematics.

According to Indraningtias (2017: 25), mathematics is one of the sciences that can develop synthetic, analytical, and original thoughts. One of the lessons that can help develop critical thinking skills is Problem Based Learning (PBL) according to Asriningtyas (2018). Setyo (2020:19), the purpose of the PBL learning model is to form thinking based on analysis of problem-solving that the topics studied get solutions. Through these goals, students can feel that learning is very relevant to everyday life. The use of PBL learning in the classroom can improve problem-based skills, collaboration capacity, fluctuating knowledge, and motivate independent learning. The characteristics of PBL according to Arends in Suprihatiningrum (2013: 220-221) are providing problems or questions, focusing on interdisciplinary linkages of authentic inquiry, exhibiting and producing products, and being able to work together (collaborating). Suprihatiningrum (2013:223) provides the phases of PBL learning, which can be seen in Table 1.

**Table 1.** Problem-based learning syntax

| Stage  | Teacher Behavior  |
|--|---|
| Stage-1: Student orientation to the problems.              | At this stage, the teacher gives problems in the form of stories, events, videos, and so on. Then continued discussion between students to be able to provide alternative solutions to existing problems. |
| Stage-2: Organizing students to study.                     | The teacher assists students in defining and organizing learning tasks related to the problem.  |
| Stage-3: Guide individual and group investigations.        | The teacher helps guide students in gathering information, conducting experiments, and can explain experiments  |
| Stage-4: Develop and present the work.                     | After students, do 3 the teacher give allows students present from the study group discussion.  |
| Stage-5: Analyze and evaluate the problem-solving process. | Analyze and evaluate the problem-solving process.   |

Responsibility is a trait that must be instilled in all students. Responsibility is the foundation on which all other values rest (Wibowo, 2016). Students learn the value of taking personal responsibility for their actions. In today's online classes, students must play an active role in planning and carrying out their learning activities (Widyanti, 2020). Sobri (2020) outlines the

responsibilities of students to improve the learning process through online participation by conducting independent learning, diagnosing learning needs, and evaluating learning outcomes. In addition to online learning, the affective attitude of responsibility will also be very important in face-to-face learning. Because the attitude of responsibility is very important for students, so maybe students' critical thinking skills are related to their affective attitudes. According to Sari (2021:114), the indicators of responsibility can be seen in table 2 as follows:

**Table 2.** Indicators of responsibility

| No. | Observed Aspects  |
|-----|---|
| 1   | <p>Before you start learning, you should be ready to learn.</p> <ul style="list-style-type: none"> <li>a. Students have learning readiness, namely preparing learning reference sources.</li> <li>b. Students prepare physically, psychologically, and with facilities.</li> </ul>  |
| 2   | <p>Actively participate in learning</p> <ul style="list-style-type: none"> <li>a. Students are active when participating in learning, for example, by actively asking the teacher and giving a good response to the teacher.</li> <li>b. Students, when participating in learning, focus on the things discussed.</li> <li>c. During teaching and learning activities, students pay attention to the teacher's explanation.</li> </ul>        |
| 3   | <p>Discipline and complete assignments on time.</p> <ul style="list-style-type: none"> <li>a. Students work on assignments according to a predetermined schedule.</li> <li>b. Students send assignments during online learning according to a predetermined schedule.</li> <li>c. Students work on assignments with time discipline and honestly according to the instructions given.</li> </ul>  |
| 4   | <p>Take the initiative to be actively involved in completing group assignments.</p> <ul style="list-style-type: none"> <li>a. Students can group according to orders from the teacher.</li> <li>b. Students actively discuss with group members.</li> <li>c. Students do the assignments given by the teacher.</li> <li>d. When the teacher provides an opportunity for presentations, students carry out orders from the teacher.</li> </ul> |

Elfina (2020:28) stated that to improve critical thinking skills, as educators, we need variations during the learning process, one of which is using learning media such as student worksheets. The student worksheets used by educators adjust the needs of students so that the student worksheets that have been made can achieve learning objectives. Wardana (2019:11) states that student worksheets are a sheet of paper for compiling problem-solving schemes or making designs, recording observational data, and consisting of discussion sheets or student work exercises. Through student worksheets, students can be motivated to understand the concept of the material and can help students to practice responsible attitudes.

Based on the description above, the ability to think critically is one of the skills needed by students to deal with all mathematical problems. Educators who act as facilitators are very influential in the learning process. The learning process is related to the application of educators in using learning models in schools. Problem Based Learning (PBL) is widely recognized as one of the most successful strategies to encourage the development of critical thinking skills. Thus, researchers are interested in implementing and studying further the application of the PBL learning model assisted by student worksheets to be able to improve critical thinking skills and responsibility so that students are expected to have a better influence.

## RESEARCH METHOD

Based on the description above, the ability to think critically is one of the skills needed by students to deal with all mathematical problems. Educators who act as facilitators are very influential in the learning process. The learning process is related to the application of educators in using learning models in schools. Problem Based Learning (PBL) is widely recognized as one of the most successful strategies to encourage the development of critical thinking skills. Thus, researchers are interested in implementing and studying further the application of the PBL learning model assisted by student worksheets to be able to improve critical thinking skills and responsibility so that students are expected to have a better influence.

Classroom action research can be seen as an effort to improve the learning process or to overcome problems encountered during the learning process. By taking collaborative and participatory actions, researchers can obtain the truth and practical benefits stated by Mulyasa (2013: 34).

Classroom action research was carried out through 2 cycles and involved the stages of planning, observing, and reflecting. The cycle ends once the success indicator is reached. According to Arikunto (137:2014). Observations, interviews, and field notes were all used to collect data for this study. This study uses a questionnaire to collect information on affective attitudes of responsibility using a 4-point Likert scale (SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree) to determine the extent to which students assume their education and are responsible on their progress, and the statement items are divided into positive and negative statements.

The critical thinking ability knowledge test questions obtained an interval of a minimum score of 0 to a maximum of 13 in the first cycle, a minimum score of 0 to a maximum score of 16 in the second cycle, and a minimum score of 20 to a maximum score of 80 for filling out the responsibility questionnaire. Calculations obtained from categorization with three levels are obtained by the following formula according to what is shown in Table 3, Table 4, and Table 5.

**Table 3.** Cycle I category level of critical thinking ability

| Interval             | Category |
|----------------------|----------|
| $x > 8,67$           | High     |
| $4,33 < x \leq 8,67$ | Fair     |
| $x \leq 4,33$        | Low      |

**Table 4.** Cycle II category level of critical thinking ability

| Interval              | Category |
|-----------------------|----------|
| $x > 10,67$           | Hight    |
| $5,33 < x \leq 10,67$ | Fair     |
| $x \leq 5,33$         | Low      |

**Table 5.** Responsibility attitude

| Interval         | Category |
|------------------|----------|
| $x > 60$         | Hight    |
| $40 < x \leq 60$ | Fair     |
| $x \leq 40$      | Low      |

## RESULTS AND DISCUSSION

Based on the results of classroom action research conducted on class VII B students at SMPN 1 Bantul, resulted in an effect when researchers used the PBL model from cycles I and II. Indicators of critical thinking include the following abilities, as outlined by Asriningtyas (2018), the ability to

analyze arguments, the ability to ask questions, the ability to answer, the ability to solve problems, the ability to conclude, and the ability to evaluate or assess as a whole.

Classroom action research was conducted in 2 cycles. Cycle I with the material properties of a quadrilateral carried out as many as 2 meetings and triangles and cycle II with material about the circumference and area of a triangle with 2 meetings. with the problem-based learning model, it begins with opening the lesson by greeting, asking one of the students to lead the prayer, and checking the attendance of the students. The researcher gave a little motivation to the students to be enthusiastic about learning and to be diligent in following the learning in class. The researcher distributed student worksheets and prerequisite questions and explained the rules that apply in working on the student worksheets. The researcher asked the students to work on the prerequisite questions individually first to find out the students' initial abilities regarding the material to be taught. Then the researcher asked one of the students to work on the problem in front of the class. After that, the researcher conveys the objectives of the learning to be studied.

After students understand the learning objectives presented, the researcher asks students to respond to discussions of contextual problems related to the quadrilateral and triangle material. This activity is the first phase of the problem based learning (PBL) learning model, namely the orientation of students to the problem followed by phase 2 organizes students to learn by forming study groups of 2-3 students. In phase 3 Guiding individual and group investigations, researchers assist students in conducting investigations with the tools and media that have been provided. Researchers go around to see students discussing and provide assistance if there are students who have difficulty. Discussion activities are activities to solve problems on student worksheets. After the students complete the student worksheets, then the fourth phase is developing and presenting the results of the researcher's work ordering group representatives to present the results of the discussions that have been carried out. One of the group representatives came forward and presented the results of their group discussion and the other groups listened to it. Furthermore, in the phase of analyzing and evaluating the problem-solving process, the researcher provides opportunities for students who are not presenting to actively ask questions related to the explanation given by the group who is making a presentation.

After that, the group that was making presentations continued to respond to questions given by other groups. The last Problem Based Learning syntax is to analyze and evaluate the problem-solving process. The researcher reviewed the students' understanding of the concepts of quadrilaterals and triangles. Then the researcher gave interaction to groups that had different answers to questions related to their understanding of quadrilaterals and triangles. After the activity with the Problem Based Learning (PBL) model was completed, the researcher gave a posttest test of critical thinking skills with quadrilateral and triangle material. The researcher conveys the material to be studied at the next meeting and then reminds students to learn to prepare for the test that will be carried out at the next meeting. The researcher said to write down the reflection of rectangles and triangles. The researcher also said to fill out the responsibility questionnaire through the link provided. The researcher ended the lesson by saying greetings.

### Cycle I

Through the learning process on mathematics subjects with the material properties of rectangles and triangles before the action is taken, it is revealed that there are problems that cause learning to be not optimal. It is evident from the results of the pretest of critical thinking skills in the first cycle that only 22% with high criteria and posttest results produce 56% with high criteria. While the results of the questionnaire filling test results achieved by students in the first cycle of the first meeting resulted in 44% with high criteria and at the second meeting yielded 59% with high criteria. So in the first cycle was an increase, but it did not meet the success indicator of at least 70% with high criteria.

## Cycle II

Observation of the learning process in mathematics subjects about the perimeter and area of quadrilaterals and triangles. It is evident from the results of the critical thinking ability test in the second cycle which resulted in 71% with high criteria and the responsibility questionnaire test results achieved by students in the second cycle yielded 75% with high criteria. So that in cycle I cycle there is an increase and meet the success indicators of at least 70% with high criteria. So that this research was carried out until Cycle II.

This research is in line with research conducted by Ayu Astuti in 2017 with the title of applying a problem-based learning model to improve the mathematical critical thinking skills of students in class X SMK N 3 Kasihan. Further research should provide additional affective attitudes in addition to responsibility and can also use the help of other teaching materials. So that research can find out whether high critical thinking skills also affect other affective attitudes. Further research can also relate to the ability to think creatively integrated with affective attitudes by the educational paradigm.

## CONCLUSION

Classroom action research conducted in class VII B of SMPN 1 Bantul using the PBL (Problem Based Learning) learning model assisted by student worksheets on mathematics subjects proved that it was effectively used to improve critical thinking skills. aims for indicators of success and improvement from 56% to 71% The critical thinking ability of students increases from Cycle I to Cycle II. Furthermore, from cycle I to cycle II there was an increase in student participation being the responsibility of students, from 59% to 75%.

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