

Improving Students' Interpersonal Skills Through Problem-Based Learning

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Abstract. Students' interpersonal skill is an ability in twenty-first century to complete the learning, thus the student achieving certain social goals in their environment. This study aimed to improve students' interpersonal skills through problem-based learning. The participant in this study is seventh grade in islamic private school in Yogyakarta, Indonesia. The number of students is 30 students in the school year 2017/2018 and have an age range of 12 to 13 years. Important for the first grade of a junior high school to enhance interpersonal skills between student-teacher and student-student. This study was classroom action research with two cycles. The stages of each cycle were planning, action, observation, and reflection. The instrument used in this study were classroom observation and interpersonal skills questionnaire. Data analysis was obtained from questionnaire score and observation sheet learning. Both of them were converted from quantitative data to qualitative data. The results showed that the average score of questionnaire of students' interpersonal skills obtained has increased in each cycle. The category of Initial condition was medium (94.33), cycle I was high (102.81), and cycle II was high (118.51). The study concluded that Problem-based learning helped students to improve interpersonal skills.

INTRODUCTION

Mathematical are basically related to everyday life. Usefulness of mathematics can be felt in a variety of ways. These all see mathematics as primarily a powerful toolkit to help them understand and solve problems from the real world [1]. In line with Adam and Hamm, there are some positions and the role of mathematics, namely mathematics is a way of thinking and asking questions, it is related to how students make planning related to mathematics, organize your thoughts, analyze data, and solve problems [2]. Based on the position and role of mathematics shows that mathematics is an important lesson to learn because it is useful in daily life and relational in the subjects with other fields. Despite knowing this, some research stated that generally students think that mathematics is difficult to master [3,4]. Therefore, some students perform very well while some fail to master this subject even when they are facing the easy topics in the subject [3]. However, students still need to learn mathematics because of its importance in everyday life [5].

Students can develop their mathematics learning with the help of a teacher and peers. This related to how students interact with peers and teacher in the learning and outside learning. Students' personal and social development is as important as their cognitive development [6,7]. It is important for students to think well of themselves, to have a positive rather than a negative self-concept [6]. It is related to social ability of student that socially competent people as those who posses the skills necessary to produce desired effects on other people in social situation [8]. Students need to learn appropriate social skills that promote positive interaction with others include showing empathy skills, participation in group activities, generosity, helpfulness, communicating with

others, negotiating and problem solving [6,8,9,10]. The terms 'social skills', 'interpersonal skills' and 'communication skills' are often used interchangeable [11].

Interpersonal skills in a global sense, can be define as the skills we employ when interacting with other people [9,11]. Hayes define interpersonal skills as a goal-directed behaviours used in face-to-face interactions in order to bring about a desired states of affairs [8]. In addition by Pichler define interpersonal skills as an important part of effectively working with other and leading others [12]. However, working with other and leading other people must be there is an interaction. The facilitate interpersonal skills that include actively listening such a paying close attention to what is being said to each other during group discussions, be open and responsive considering the other person's perspective on issues, communicate new ideas to others effectively and stating ideas freely without fear of derogatory comments, being responsible for one's own behaviour, constructively critiquing the ideas presented [13,14]. It reveals that oral communication has a role in interpersonal skills to express opinion and new ideas [14].

Research on interpersonal skills has been studied by Tremblay who examine interpersonal skills in elementary school, Skinner has researched interpersonal skills on health profesional student, Bambacas and Ferris has researched interpersonal skills at work [6,15,16,17]. This study focus on interpersonal skills in middle school, more precisely in islamic private school that different from the studies mentioned above. Based on pre-research in class seven, students were given an interpersonal skill questionnaire to obtained intial condition. The data showed the categories of students on interpersonal skills in mathematics learning. The results were obtained student in very high category was equal to 0%, while high category was 40.74%, middle category was 51.85%, low category was 7.4%, and very low category was 0%.

The initial condition of students' interpersonal skill requires improvement by doing the learning with the student centered learning model so that to improve students' interpersonal skills. Most mathematical concepts or generalisations can be effectively introduced using a problem situation [18]. Problem triggers the context for engagement, curiosity, inquiry and a quest to address real-world issues [19,20]. Torp define problem-based learning is focused, experiential learning (minds-on, hands-on) organized around the investigation and resolution of messy, real-world problems [20]. Problem-based learning helps students to see that learning and life take place in contexts, contexts that affect the kinds of solutions that are available and possible [21]. In addition, Alavi stated that problem-based learning reflects the real process of knowledge generation [22]. Problem based learning is a student centered approach [23]. Problem-based learning works well with all students, making its strategies ideal for heterogeneous classrooms where students with mixed abilities can pool their talents collaboratively to invent a solution [19].

Based on descriptive above, the problem rests on how to improve the interpersonal skills of students in mathematics learning with problem-based learning model. According to research results by Tocci stated that affective variables as important as cognitive variables in achieving learning outcomes [7]. The ability of students in schools should not be limited to the achievement but also should include the student affective variables. This study is expected to be help students to improve interpersonal skills in mathematics using problem-based learning model as an alternative teaching

EXPERIMENTAL METHOD

1.1. Research Design

This type of study is the classroom action research . This study design used is the cycle model developed by Kemmis and Mc. Taggart which consists of four stages are planning, action, observation, and reflection [24]. This study is collaborative with mathematics teacher in islamic private school.

1.2. Research Time and Participant

This study was conducted in the first half of 2017/2018 school year. The participant in this study is seventh grade in a private Islamic school in Yogyakarta, Indonesia. The number of students is 30 students consisting of 17 male and 13 female with age range of 12 to 13 years.

1.3. Data Collection Techniques

Instruments used in the classroom action research were observation sheet of learning implementation and questionnaires of students' interpersonal skill. Observation sheet of learning implementation used to assess implementation of the learning model used in the learning process. Observation sheet in terms of three aspects: the preliminary activities, core activities, and closing activities. This observation sheet of learning implementation has two assessment scale are yes and no.

Questionnaires of students' interpersonal skills given before treatment is used to measure the initial conditions of students' interpersonal skills. Interpersonal skills questionnaire given after treatment is used to measure the students' interpersonal skills at the end of the cycle. Questionnaires of students' interpersonal skills has two aspects assessed, social sensitivity and communication. In the aspect of social sensitivity, is divided into four indicators were empathy, interaction, self-awareness in the social environment. While in the communication aspect is divided into three indicators were speaking, listening, and giving feedback to other people. The questionnaire consisted positive and negative question with five answer options in accordance with the likert scale items, namely always, often, sometimes, rarely, never.

1.4. Data Analysis Techniques

Analysis of the data used in this research is descriptive qualitative data analysis and supported by quantitative data analysis.

1.4.1. Analysis of Observation Results

Observation sheet using two assessment scales, the score of 1 if implemented and a score of 0 if it is not implemented. Analysis of the results of observations of learning enforceability analyzed using percentages.

1.4.2. Analysis of Questionnaire Results

Scoring questionnaire interpersonal skills have a range of 30 to 150. The range is used to determine the criteria for the measurement results by following data conversion category using the scale created by Widoyoko [25] in Table 1

TABLE 1. Category of Data Conversion

Interval Score	Score (X)	Category
$X > (\bar{X}_i + 1,8 \text{ SDi})$	$X > 126$	Very High
$(\bar{X}_i + 0,6 \text{ SDi}) < X \leq (\bar{X}_i + 1,8 \text{ SDi})$	$102 < X < 126$	High
$(\bar{X}_i - 0,6 \text{ SDi}) < X \leq (\bar{X}_i + 0,6 \text{ SDi})$	$78 < X < 102$	Middle
$(\bar{X}_i - 1,8 \text{ SDi}) < X \leq (\bar{X}_i - 0,6 \text{ SDi})$	$54 < X < 78$	Low
$X \leq (\bar{X}_i - 1,8 \text{ SDi})$	$X \leq 54$	Very Low

Indicator of Success

This study using indicator of success as reference to determine whether the cycle continues or stops. Indicator of success in this study based on target presented in Table 2.

TABLE 2. Indicator of Success

Variabel	Category	Target
Interpersonal Skills	Very high	25.92%
	High	51.85%
	Medium	18.51%
	Low	0%
	Very Low	0%
Learning Implementation	Average	High
	Implemented	$\geq 85\%$

RESULT AND DISCUSSION

1.5. Description of Cycle I

1.5.1. Planning

At the planning stage, researchers and teachers make preparations determine the topic of subject matter that will be used to research, develop lesson plan of problem-based learning model, compiling student worksheet, prepare instruments, develop guidelines for observation and setting up observation sheet. The topic of subject matter in

this study is equation and inequalities of one variable. Preparation of lesson plan adjust the material at each meeting and problem-based learning model used.

Lesson plan is organized into two meetings for cycle I which contains core competencies, basic competencies, indicators, learning objectives, and action steps with time allocations. Student worksheet prepared for each meeting adjust to the lesson plan that has been arranged. Prepare instruments for cycle I were questionnaire of students' interpersonal skills and observation sheet of learning implementation.

1.5.2. Action

Implementation of the cycle I was conducted in two meetings with a duration of 5 hours of lesson time or 200 minutes. Sub-material in the first meeting about differentiate between statements and open sentences and write the mathematical sentence of a sentence in daily life that contains the context of the equation. In the preliminary activity, teacher learning opens with prayer, giving apperception by questions and answers related to the students' understanding of algebra as prerequisite material. After knowing some students still remember the use of algebra, the learning proceed by conveying the learning objectives to be achieved, then the students are divided into several groups to be given student worksheet. Each group consists of 4-5 students. In the core activities, the teacher introduces a problem of differentiate an open sentence and statements. Students are actively discussing to work on and complete the student activity sheet. Several students asked whether their answers were right on the worksheet. Afterwards the teacher asks the groups to present their results, but the students still incline of shame and confused how to explain from what they have done, so that teacher selects the ready group. In the closing activity, teacher asks questions to confirm whether the student has understood the material of the first meeting as an evaluation, give the students assignments, and closed the learning by pray and greeting.

The second meeting of cycle I discuss about determining equivalent form using sum, subtraction, multiplication, and division. In the preliminary activity, teachers explain about the use of scales as a stimulus for students in understanding the materials of equality. After that the students form groups and teacher give them a student worksheet. In the core activities, teacher guides the students to find the equivalent equation concept by following the steps in student worksheet. Each group given teaching tool are origami paper, scissors, and glue which is arranged following the guidance in student worksheet. The presentation at the second meeting was the same as the previous meeting that only two groups were given the opportunity to present their group results because the findings of each group is almost the same. There is one group that understands the concept of equation is equivalent to displace the numbers or variables from right to left or reverse. Hence the teacher gives an explanation related to it as evaluation, then teacher closed the learning with the same activity in first meeting.

1.5.3. Observation

Students still do not understand the step of worksheets that start from a problem to determine concept in differentiate the statements and open sentence. When students have completed the presentation, several groups of students chatting and drawing when the teacher confirm the results of the students' answers as well check the truth of the answers to each group. Students are still not used to learn the start of a problem. Teachers tried to lure students to follow the stages of problem-based learning, especially in terms of ask and presentation. The implementation of learning and questionnaire of students' interpersonal skill results in the first cycle can be seen in Table 3 and Table 4.

TABLE 3. The Observation Result of Learning Implementation in Cycle I

Meeting	Teacher Activity (%)	Student Activity (%)
1	80%	80%
2	84%	84%
Mean	82%	82%

TABLE 4. Students' Interpersonal Skills Questionnaire in Cycle I

Category	Percentage
Very High	7,4%
High	62,96%
Middle	29,62%
Low	0%
Very Low	0%

Data in observation results of learning implementation showed that teacher activity and student activity has not reached the target. The result of students' interpersonal skills questionnaire in cycle I acquired an average increase in the from 94.33 category are being increased to 109.81 with the high category. So the increase occurring in the first cycle has reached a high target, but has yet to reach the target by a given percentage.

1.5.4. Reflection

Reflection activities conducted through analysis and evaluation phase of the action in the first cycle that has been done. Reflection is based on the results of questionnaires, observation sheets, and field notes the researcher. Reflection in Cycle I were:

- Students are still less active following the learning process by using a model of problem-based learning. This is caused because students are not familiar with working in groups to seek solutions invented the concept of the problem set by teacher.
- Formation of the group very easily discussed together how the group was formed. But there are two students who did not want to join the other group, so that the two students form their own groups.
- Discussion of the group is already running although not maximized because there are some groups whose members work itself and the other is chatting with other friend.
- There is no student wants to do the presentation, so that the teacher should appoint the group presentation.

1.6. Description of Cycle II

1.6.1. Planning

At the planning stage in cycle II is a continuation of cycle I. Planning is made with the points of improvement already discussed with the teacher. Preparing lesson plan of problem-based learning model, compiling student worksheet, prepare instruments, and setting up observation sheet.

1.6.2. Action

Implementation of the second cycle was conducted in two meetings with a duration of 5 hours of lesson time or 200 minutes. Sub-material in the third meeting about determining the meaning of symbols of inequality, write a mathematical sentence of a sentence containing the context of inequality, express the solution of the linear inequality of one variable into the number line, and determine the completion of the linear inequality of one variable. In the preliminary activities, the teacher gives apperception through question and answer with the aim to explore the students' initial knowledge about linear equations of one variable, it is useful to distinguish with linear inequality one variable. In the core activity, teacher guide students to discover of using inequality sign and use it to create a number line by following the steps in student worksheet. There is one group want to share their work in front of class, after that teacher give opportunity to another group to presentation. At the closed activity, the teacher gives an explanation related to it as evaluation, then teacher closed the learning with the same activity in the first meeting.

In the fourth meeting discuss about solve daily problem related to linear equation of one variable and linear inequality of one variable. In the preliminary activity, the teacher gives apperception about the sign of inequality and inequality solutions using addition and subtraction. The teacher explains how the sign of inequalities change or unchange through example as astimulus for students in understanding the material. In the core activity, teacher guide students to discover the concept of using inequality sign and apply equations and inequality into daily life to solve problems by following the steps in student worksheet. The presentation at the fourth meeting was the same as the previous meeting that only two groups were given the opportunity to present their group results. At

the closed activity, the teacher gives an explanation related the sub-bab material as evaluation, then teacher closed the learning with the same activity in the first meeting.

1.6.3. Observation

In general, the observation of active student engagement in learning has been run better. This is evident from the enthusiastic students asking questions and doing worksheets. Activeness and enthusiasm of students was evident when the students gave different results of group discussion presentation of results with another group, so that teachers understand where students are still confused. Some groups seemed enthusiastic in working quickly to ask the true answer to the teacher. The implementation of learning and questionnaire of students' interpersonal skill results in the first cycle can be seen in Table 5 and Table 6.

TABLE 5. The Observation Result of Learning Implementation in Cycle II

Meeting	Teacher Activity (%)	Student Activity (%)
1	88%	88%
2	92%	92%
Mean	90%	90%

TABLE 6. Students' Interpersonal Skills Questionnaire in Cycle II

Category	Percentage
Very High	81,48%
High	18,51%
Middle	11,11%
Low	0%
Very Low	0%

1.6.4. Reflection

Reflection activities conducted through analysis and evaluation phase of the action in the cycle I and cycle II that have been done. Reflection is based on the results of questionnaires, observation sheets, and field notes the researcher. Reflection in cycle II were:

- Students have started to respond positively to the implementation of model learning problem-based learning. Most students have started to know the direction of learning because of the steps of what activities should be done by students.
- Students are also actively discussing in groups, as well as to ask the teacher a lot more related to finding solutions to problems on the worksheets provided.
- The use of time spent in learning is in conformity with the planned time allocation in the lesson plan.

Based on the observation and analysis of the data in the second cycle, it appears that the implementation of learning using problem-based learning models have been able to enhance the interpersonal skills of students. Interpersonal skills students have already reached the pre-determined targets. It can be concluded that the actions in in this study had enough and can be stopped in the second cycle.

CONCLUSION

Descriptive above shows that the average score students' interpersonal skills in initial condition is 94.33 with the middle category. After being given the action, in the first cycle the average score of students into 109.81 with the high category, but has not reached the set of target. So that action is taken on the second cycle and showed that there was an average increase of students' interpersonal skills become 118.51 with the high category and exceeded the targets set. Based on descriptive of results and discussion, we can concluded that problem-based learning can be alternative learning model to improve students' interpersonal skills.

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REFERENCES

1. H. Burkhardt, "Modelling in mathematics classrooms: Reflections on past developments and the future", *ZDM Mathematics Education* 38 (2) 178-195, (2006).
2. D. Adams and M. Hamm, *Demystify math, science, and technology: Creativity, innovation, and problem solving* (Plymouth: Rowman and Littlefield Education, 2010).
3. A. Veloo A, R. M. Ali and H. N. Krishnasamy , "Affective determinants of additional mathematics achievement in malaysian technical secondary school", in *Procedia - Social and Behavioral Sciences* 112 613-620, (2014).
4. N. g. Ignacio, L. J. B. Nieto and E. G. Barona, "The affective domain in mathematics learning", in *International Electronic Journal of Mathematics Education* 16-32, (2006).
5. L. Kaufman, "Dyscalculia: Neuroscience and education", in *Journal Education Research* 163– 175, (2008).
6. O. Tremblay and L. Celeste, *Students' interpersonal skills instruction and self-esteem The Electronic of Theses and Disertation* (University of Windsor, 2000).
7. C. M. Tocci and G. Jr. Engelhard, "Achievement, parental support, and gender differences in attitudes towards mathematics", in *Journal of Educational Research* 280 – 286, (1991).
8. J. Hayes, *Interpersonal skills at work* (New York: Routledge, 2002).
9. S.A. Lynch and G. S. Cynthia, "Social skills: Laying the foundation for success", in *Dimensions of Early Childhood* 38 (2) 3-12 , (2002).
10. J. F. Talarico, A. J. Varon, S. E. Banks, J. S. Berger, E. G. Pivalizza, G. M. Rivera, and J. Rimal, "Emotional intelligence and the relationship to resident performance: a multi-institutional study" (Journal of Clinica, 2013), pp. 181-187.
11. O. Hargie, *Skilled interpersonal communication: Research, theory and practice* (New York: Routledge, 2011)
12. S. Pichler and G. Beener, "Toward the development of a model and a measure of managerial interpersonal skills", *Leader interpersonal and influence skills: The soft skills of leadership* ed R Riggio and S Tan (New York: Routledge, 2014) pp11-30.
13. R. M. Gillies and A. F. Ashman, *Cooperative Learning: The social and intellectual outcomes of learning in groups* (London: SAGE Publications, 2003)
14. National Research Council, *Assessing 21st century skills: Summary of a workshop* (Washington DC: The National Academies Press, 2011).
15. K. L. Skinne, S. J. Hyde, K.B.A. McPherson and M. D. Simpson, "Improving students' interpersonal skills through experiential small group learning", in *Journal of Learning Design* 21-36, (2016).
16. M. Bambacas and M. Patrickson, "Interpersonal communication skills that enhance organisational commitmen", in *Journal of Communication Management* 51-72, (2008).
17. G. R. Ferris, L. Witt and W. Hochwarter, "Interaction of social skill and general mental ability on job performance and salary", in *Journal of Applied Psychology* 1075-1082, (2001).
18. National Council of Teacher of Mathematics (NCTM) 2000 *Principles and standards for school mathematics* (Reston: NCTM)
19. T. O. Seng, *Problem-based learning innovation: using problems to power learning in the 21st century* (Singapore: Gale Cengage Learning, 2003)
20. L. Torp and S., Sage, *Problem as possibilities: Problem-based learning for k-16 education* (USA: Association for Supervision and Curriculum Development, 2002).
21. M. Savin and Baden, *Facilitating problem-based learning: illuminating perspectives* (USA: The Society for Research into Higher Education & Open University Press, 2003).
22. C. Alavi, *Problem-based learning in a health sciences curriculum* (London: Routledge, 2002).

23. R. I. Arends and A. Kilchers, *Teaching for student learning (becoming an accomplished teacher* (New York: Routledge Taylor and Francais Group, 2010).
24. S. Kemmis, R. McTaggart and R. Nixon, *The action research planner doing criical participatory action research* (New York: Springer, 2014).
25. E. P. Widoyoko, *Evaluasi program pembelajaran panduan praktis bagi pendidik dan calon pendidik* (Yogyakarta: Pustaka Pelajar, 2011).