

Research Article

The Impact of Implication Problem Posing Learning Model on Students in High Schools

Suarlin¹, Surabhi Negi², Muhammad Ichsan Ali³, Bilal Ahmad Bhat⁴, Elpisah⁵¹Department of Education Science, Universitas Negeri Makassar, Makassar 90222, Indonesia²Department of Education, Lady Irwin College, University of Delhi, Delhi 110021, India³Department of Civil and Planning Education, Universitas Negeri Makassar, Makassar 90224, Indonesia⁴School of Education and Behavioral Sciences, University of Kashmir, Srinagar, 110021, India⁵Department of Economic Education, STKIP Pembangunan Indonesia, Makassar, 90233, Indonesia

Contact email: suarlin@unm.ac.id, surabhi.negi@lic.du.ac.in, m.ichsan.ali@unm.ac.id, bilal66127@gmail.com, elpisah77.amir@gmail.com

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Abstract: Problem posing is a learning model that requires students to compose their questions or solve a problem into more straightforward questions that refer to solving the problem based on the initial situation. The study aimed to determine the increase of students in mastering the learning material through the Problem Posing Learning Model. The type of research used in this study is quasi-experimental research. The sample used was 64 high school students with mathematics as the learning subject. There are two class groups: the experimental class with 31 students and the control class with 33 students. The research data obtained were processed by analysis of the paired sample t-test. The research results found that learning with the problem-posing approach made students active and creative, as seen from the ability of students to develop their questions based on the information provided. Students can process and explore existing information and ask problems or questions that can be resolved. Learning with the problem-posing approach can also increase student activity in the learning process, especially in interacting and sharing ideas with other students and with the teacher. Learning activities are meaningful, and student understanding of the concept becomes better.

Keywords: Conventional Approach, Learning Model, Learning Activities, Learning Evaluation.

1. Introduction

Globalization is a process of complete change in all the joints of human life. Globalization emerged as a result of the rapid development of information and communication technology [1]. One of the internal challenges of developing countries today is to strive for the productive age human resources owned by the nation can be transformed into human resources that have competencies and skills through education to become a burden [2].

Quality human resources are the investment of the future. Education plays an essential role in the preparation of these human resources [3]. Through education, the next

generation of the nation is independent, responsible, and moral. Education is also a vehicle that can help improve people's standard of living. With education, human beings can develop intellectual, physical, emotional, mental, social, moral, and ethical potential through education [4]. Optimization in resources and quality will significantly improve Indonesia's competitiveness as a country of skilled labor providers and producers of quality products for countries. High schools hope to answer the internal challenges of education and create opportunities in winning the global competition.

The implementation of learning in high schools expects teachers to make learning innovations that can encourage and facilitate learners in carrying out their

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learning process from the cognitive sphere and from attitudes and confidence in facing various challenges and not fear of competition. Teachers have a vital role in instilling knowledge and fostering motivation to excel and compete with their students. Teachers must also design their responsive and student-centered learning so that their interest and motivation for achievement increase. Teachers should not think of learners as empty glasses to be filled with knowledge. However, together with learners, build knowledge [5].

The natural teaching and learning process that generally occurs in the classroom is to instill knowledge regardless of the learner's needs. In carrying out learning in the classroom, teachers are more likely to dominate teacher-centered learning so that learners' activeness in the learning process is very lacking and can inhibit the appearance of learners' appearance in the classroom. Learning is always a change in behavior or appearance, with a series of activities such as reading, observing, listening, imitating, and so forth. Changes in behavior or appearance are the result of learning done.

Learning is a relatively sedentary change in behavior that occurs as a result of exercise [6]. Meanwhile, James L. Mursell defines learning as an effort made by experiencing, exploring, exploring, and acquiring. So learning becomes a mental activity (psychic) in interaction with its environment that produces relatively constant changes [7]. According to Joyce & Weil, the learning model is a plan or pattern that can form a curriculum (long-term plan), design learning materials, and guide learning in the classroom. Learning models can be a pattern of choice. This model can be selected accordingly and efficiently to achieve the objectives of education [8].

A conventional learning approach is a classical approach, as we usually see every day in every school in

general. In this conventional learning approach, students are assumed to have relatively the same interest and learning speed. This conventional learning process is more teacher-centered. In the conventional approach with a teacher-centered approach, almost all learning activities are fully controlled by the teacher; the entire series of activities is under the teacher's control, without any attempt to find and implement learning strategies relevant to the characteristics of students [9]. In conventional learning, the teacher usually conveys information about the subject matter through explanation and oral narrative, known as the lecture method. This learning tends to make students passive because teachers' communication in their interactions with students is one-way communication. Students only listen, take notes, and occasionally ask questions about the teacher's words [10].

The problem-posing learning model is a learning method to enable students to think critically by provoking students to find problems based on the given topic to challenge and motivate students to solve them. The problem-posing learning model was first introduced by Brazilian education expert, Paulo Freire, in 1970, as outlined in the book *Pedagogy of the Oppressed*. As a learning strategy, problem-posing involves three basic skills: listening, dialogue, and action [11].

The problem-posing learning model was developed in 1998 by Lyn D. English and was initially applied in mathematics [6]. Furthermore, this model was also developed in other subjects. Learning should be more emphasized in problem-posing activities. This is to improve the ability to solve it by getting students used to asking questions. Asking questions is an activity that can challenge students to think more and build their knowledge [12].

Table 1. Comparison of Learning Activities between Problem Posing Approach and Conventional Approach

Problem Posing Approach	Conventional Approach
1. Students listen and heed the teacher's explanation of the subject matter.	1. Students listen and heed the teacher's explanation of the subject matter.
2. Students pay attention to the teacher's explanation of making a problem or problem and solving it.	2. Students pay attention to examples of questions and solutions described by the teacher.
3. Students ask questions that are not yet clear.	3. Students ask questions that are not yet clear.
4. Students make as many questions as possible from the teacher's problem situation and present them in front of the class and solve them.	4. Students practice the questions given by the teacher. (Students do not make up questions).
5. Students make a problem or problem again, then exchange it with classmates and solve it.	5. Students and teachers discuss the practice of the questions done by the students.

The selection of learning models should be based on considerations of the needs of students. The proper selection will allow the implementation of education to be

efficient by considering students' characteristics so that the quality of learning in the classroom can be increased. Silver and Cai [13] research shows that problem

formulation is positively correlated with the ability to solve problems. Of course, students' participation and active participation is the main thing in teaching and learning activities.

Based on the description above, problem posing is a learning model that requires students to compose their questions or solve a problem into more straightforward questions that refer to solving the problem based on the initial situation. In principle, the problem-posing learning model is a learning model that requires students to ask questions and solve them by learning to make questions. Through the selection of problem-posing learning models, it is expected that students are accustomed and trained to ask questions and sources of information received by students not only from teachers but also can increase the participation and activeness of students in learning and analyzing science.

Before determining the learning model to be used in learning activities, several things must be considered: (a) consideration of the objectives to be achieved. These considerations include: whether the learning objectives to be achieved are related to academic, personal, social, and competencies; (b) considerations related to learning materials; (c) considerations from the point of view of learners or students. These considerations include: whether the learning model is following the level of maturity, interests, talents, conditions, and learning styles of students; (d) other considerations that are non-technical, including to achieve the goal with only one learning model and whether the learning model the value of effectiveness or efficiency.

2. Research Methods

2.1. The Phase of Problem Posing Learning

Mishra and Iyer [14] divided the problem-posing approach into three stages, as shown in the following figure:

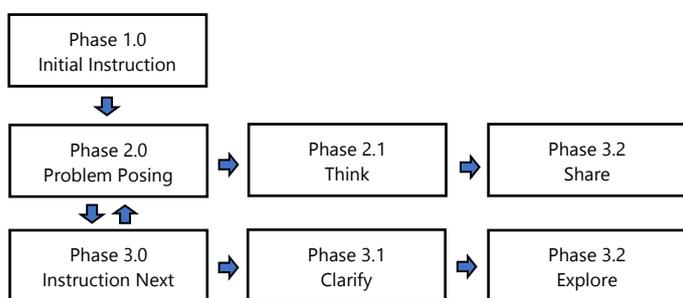


Figure 1. The Phase of Implementing Problem Posing

At this stage, phase 1 of initial instruction is marked by the teacher giving initial instructions (seeds) to students. Mishra and Iyer [14] are called "Seed Knowledge," or seeds of knowledge that explicitly have clues or components that encourage students' exploratory questions. The initial

instruction was light (less in content) and short (of short time) to ensure that students assimilate most of its contents. Students are free to take notes or write questions together to strengthen their understanding [15].

Phase 2 of problem posing, at this stage, consists of two sub-phases, namely, students are asked to ask questions or questions about the initial knowledge "seed" that was given in the previous stage. After finishing making questions based on the seeds given, the students shared their questions between one friend and another friend or one group with another group. The questions that have been created and shared are then sought for solutions or solutions individually or in groups.

At this stage, phase 3 of the follow-up instruction also consists of two phases, namely clarification and exploration. Clarification is carried out to determine the type of response given by students. Furthermore, exploration is used to construct new knowledge by students.

2.2. Research Classification and Design

The type of research used in this study is quasi-experimental research. A quasi-experiment is a type of research conducted to obtain information that does not control all external variables that affect the implementation of the experiment. In this study, using naturally formed groups, namely classes, according to Creswell [16], this study was included in a quasi-experimental study. The research design used in this study was a post-test only non-equivalent control group design. Schematically, the designs in this study are as follows.

Table 2. Research Design

Group	Treatment	Pre & Post-Test
Experiment	Problem Posing Learning Methods	Learning Outcomes
Control	Conventional Learning Methods	Learning Outcomes

2.3. Research Population

The population is defined as a generalization area consisting of subjects with specific qualities and characteristics determined by the study. The population in this study is the sampling population. The sampling population is a population whose many members are not known with certainty or are not limited. However, this population is determined by the characteristics of the student's problem-solving abilities, namely senior high school students with moderate problem-solving abilities and who have not studied complex learning material

problems. The population of high school students as the research location is 354 students.

2.4. Research Sample

The sample is part of the population. This study's sample was two senior secondary school classes consisting of two groups with 64 students. The sampling carried out in this study using convenience sampling; convenience sampling is the selection of samples from population elements based on ease of access [17].

In determining the sample of this study, the researcher was only permitted by the school to research the first class because the teacher was the same supervisor while the other two classes were different. Then, the determination of the treatment in each class of the research sample is based on the lottery results. The first group (class A) was given learning treatment using the problem-posing learning method as the experimental class, then the second group (class B) was given learning treatment using conventional learning methods as the control class.

2.5. Data Analysis

The data were analyzed using the normality test, homogeneity, and t-test to determine whether there was a difference in the mean score of the pre-test results between the experimental and control classes. This analysis also determines that students' initial abilities in the two classes are equal and worthy of comparison.

Normality testing uses the Kolmogorov-Smirnov test if it is Asymp. Sig > 0.05, the data is normally distributed. While the criteria for determining homogeneity, namely if the significant value > 0.05, the data is proven to be homogeneous.

The t-test used refers to the significant value of 0.05. If the significance value obtained is less than 0.05, the two classes are not equivalent. If the significance value is greater than 0.05, the two classes are equivalent. To test the hypothesis, researchers used the t-test. The hypothesis proposed in this study are:

- Hypothesis 1
 - H0: ($\mu_1 \geq \mu_2$) there is no effect of applying the problem-posing learning model on student learning outcomes.
 - H1: ($\mu_1 < \mu_2$) there is an effect of applying the problem-posing learning model on student learning outcomes.

The test criterion is that if t count is smaller than t-table, then H0 is accepted, and if t count is greater than t-table, H0 is rejected. As for the significance testing criteria, if the significance is greater than 0.05, then H0 is accepted,

and if the significance is smaller or equal to 0.05, then H0 is rejected.

3. Result and Discussions

3.1. Learning Evaluation Results

Student learning outcomes data were obtained after doing the test twice, namely the pre-test and post-test. The initial ability test (pre-test) is given to students in the experimental and control classes before the problem-posing learning approach treatment in the experimental class and conventional learning in the control class. The final ability test (post-test) is given to students both in the experimental and control classes after being given treatment. Data on student learning outcomes in the experimental and control classes can be seen in the following table.

Table 3. Frequency Distribution and Categorization of Experimental Class Learning Outcomes.

Category	Pre-test		Post-test	
	Freq.	Percent	Freq.	Percent
Very high	0.00	0.00	11.00	35.48
High	0.00	0.00	17.00	54.84
Moderate	0.00	0.00	3.00	9.68
Low	23.00	74.19	0.00	0.00
Very low	8.00	25.81	0.00	0.00

Table 4. Frequency Distribution and Categorization of Control Class Learning Outcomes.

Category	Pre-test		Post-test	
	Freq.	Percent	Freq.	Percent
Very high	0.00	0.00	5.00	15.15
High	0.00	0.00	17.00	51.52
Moderate	0.00	0.00	11.00	33.33
Low	23.00	69.70	0.00	0.00
Very low	10.00	30.30	0.00	0.00

Table 4 and 5 show the increase in student learning outcomes in the experimental class and control class. The distribution of pre-test scores, both in the experimental and control classes, is poor. These results indicate that the experimental class and control class have the same initial ability in the subjects.

After implementing the problem-posing learning model, learning outcomes in the experimental class showed significant results with learning outcomes in the control class. The value distribution shows that 35.48% of students get learning outcomes in the very high category in the experimental class, while in the control class, it is 15.15%. The experimental class obtained 54.84% for high

category learning outcomes, and the control class was 51.52%. The rest of the medium category's learning outcomes are 9.69% for the experimental class and 33.33% for the control class.

3.2. Hypothesis Testing

This study's hypothesis test is a parametric statistical test using the One-Sample t-test and the Independent Sample t-test. This test is used to decide whether the proposed hypothesis is accepted or rejected.

Table 5. The Results of The Different Test (T-Test) In the Experimental Class Group.

Model	N	Mean	t-value	Sig. (2-tailed)
pre-test – post-test	31	76.41	3.932	0.000

Table 6. The Results of The Different Test (T-Test) In the Control Class Group.

Model	N	Mean	t-value	Sig. (2-tailed)
pre-test – post-test	33	70.58	2.453	0.003

The t-test analysis results or different tests from students' learning outcomes after receiving different treatments in the delivery of material (post-test) can be seen in table 5 for the experimental class group and table 6 for the control class group. Table 5 shows the t-value of 3.932 with a significance of $0.000 < 0.05$, which means an actual or significant difference in learning outcomes by using problem posing on students. Then in table 6, it can also be seen that there are fundamental differences in learning outcomes using conventional learning methods. However, there is a difference in the higher mean value obtained from the experimental class group from the two results. The analysis results show a significant effect of applying the problem-posing learning model on improving student learning outcomes better than learning using conventional methods.

Based on the analysis of the students' ability to respond to problem situations or make questions based on problem-containing tasks, students who are taught with the problem-posing approach experience a positive learning process. All students are motivated to be actively involved in question formulation activities. With the problem-posing approach, students are more enthusiastic/concentrated in following the class lessons. Besides, posing problems in the classroom will make the discussion of ideas between students and one another more conducive. This study's findings are like those of a quantitative response by Silver and Cai [13] regarding the analysis of mathematical problem proposals involving 509 grade 6 and 7 graders. This study found that out of 1465

responses submitted by respondents, there were (70%) responses in the form of math problems, (10%) non-math questions, and (20%) statements. About 90% of the respondents' math problems can be solved and are following the given situation.

The results obtained from these findings indicate that learning with the problem-posing approach provides opportunities for students to develop student creativity by providing problem situations. In other words, interesting, challenging, and contextual problem situations can inspire students to develop creative ideas, both individually and in groups, to pose or create mathematical problems with varying levels of complexity. From the pedagogical perspective of mathematics, exploration through the problem-posing approach can improve students' ability to develop original thinking skills, critical thinking skills, connection, reasoning skills to solve problems, and communication skills in conveying the results of solving mathematical problems propose.

The application of the problem-posing learning model is carried out to stimulate students' involvement in the class to explore the concepts of knowledge needed to solve problems. This is in line with Freire's statement, which states that knowledge will only emerge through re-discovery, investigation of curiosity, impatience, and continuity carried out by humans [11]. Problem posing is a learning model that will harness the tremendous power of many minds working together. Teachers are no longer teachers and policy givers, but they become listeners, facilitators, and learners because they will be very qualified and effective if they know when to listen to their students [18].

In problem-posing learning, students must formulate or make their questions then answer them based on the material given [19]. This activity allows students to come up with more straightforward questions to solve more complex questions. This learning model begins by providing material and initial information to students. Based on this material, students are asked to make and formulate questions. In making questions, students are allowed to read and collect information from various sources. This learning model's last stage is that students test alternative answers to formulate general solutions to the questions given [20].

Brown and Walter [20] stated that problem posing in learning mathematics has two cognitive stages: accepting and challenging. The receiving stage is an activity where students receive a predetermined assignment or problem. At the same time, the challenging stage is an activity where students challenge the assignments given in problem formulation. Thus, what is meant by the problem-posing approach in this study is an approach that emphasizes the formulation or posing of problems by students from the

available situations or assignments. At the same time, the definition of the problem in this study is a question or question. By making or constructing a problem or problem that can be solved, students continually construct new understandings based on the available information. The questions that are raised often trigger the formation of a more stable understanding of a person. Students can develop mathematical thinking patterns through the problem-posing approach, such as logical and critical thinking. Furthermore, the development of problem posing in mathematics will improve problem-solving abilities.

The results of this study are in line with the results of research conducted by Daponte [21], which states that the application of the problem-posing learning model can make students involved and active in asking questions about the data provided, looking for and formulating alternative answers from a series of examples given, resulting in sub-problems that are easier to solve more significant problems, test alternative answers and reformulate them, and generalize to get general solutions to the problems given.

4. Conclusion

There is a different application of treatment in delivering and presenting material to these students, namely in the experimental class, students make and answer questions themselves not as a test but as a learning model in activating students in learning. The demand for making questions and answering them themselves makes students actively find various sources and references to meet learning demands. This stimulates the ability to think critically and deepen concepts by students so that they will be better able to understand the learning material provided. This description shows that the formulation of the second problem has been answered, namely, applying the problem-posing learning model on student learning outcomes.

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