Edelweiss: Journal of Current Innovation in Educational Research
Vol. 03, No. 01, July 2025 pp 1-9
E-ISSN: 3021-7717
DOI: https://doi.org/ 10.62462/edelweiss.v1i1.4

IMPROVING THE LEARNING OUTCOMES OF CLASS X TKJ SMK PERSIAPAN PEMATANG SIANTAR STUDENTS IN BASIC PROGRAMMING SUBJECTS USING A PROBLEM-BASED LEARNING MODEL

Holand Naibaho
Universitas Methodist Indonesia
Address
*Corresponding Author, email: holandnaibaho@gmail.com

Received: July, 27, 2025 Revised: October, 10, 2025 Accepted: October, 12, 2025

ABSTRACT

This study aims to improve the learning outcomes of students in class X TKJ SMK Persiapan Pematang Siantar in Basic Programming subject using Problem Based Learning learning model. The research was conducted considering the challenges in Basic Programming learning that affect student learning outcomes. The research method used is Classroom Action Research by collecting data through learning outcome tests, documentation and observation. The results showed that in the third cycle, the classical learning completeness rate reached 90%, which is included in the very high category. This shows that the use of Problem Based Learning model has significantly improved students' learning outcomes. In addition, students' responses to this learning model were also positive, with the emergence of a spirit of cooperation, activeness in learning, active participation in discussions, and clear delivery of ideas or opinions. Therefore, the Problem Based Learning learning model can be used as an effective alternative to improve student learning outcomes in Basic Programming subjects.

Keywords: *Problem Based Learning, Learning Outcomes, Vocational School.*

Introduction

Education plays an important role for humans. According to Law No. 20 of 2003, education is a deliberate and planned effort to create a learning environment and learning process so that students can actively develop their potential, including spiritual and religious strength, self-control, personality, intelligence, good morals, and skills needed for the interests of themselves, society, nation and state (Hasbullah, H, 2022). In addition to being a basic human need, education also has an important role in developing individual potential to face technological advances and changing times. In accordance with Law No. 20 of 2003, the purpose of education is to develop the potential of students to become individuals who have faith and devotion to God Almighty, have good morals, are healthy, knowledgeable, skilled, creative, independent, and become democratic and responsible citizens (Arifin,

Z., 2022). Law No. 20 of 2003 states that education aims to develop the potential of students to become human beings who are faithful and devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens (Arifin, Z., 2022). This proves that in a country, education is the key to successful national development. Therefore, education must be considered and improved in order for the country to develop successfully. The development of technology in Indonesia significantly affects the achievement of learners with diverse consequences, both in positive and negative aspects. The influence of this rapid development of science and technology has a positive impact and a negative impact. (Jamun, 2018). In order to deal with these adverse consequences, collaboration between the roles of teachers and parents is needed. Therefore, education in Indonesia currently requires special attention in order to achieve the success of national development. This progress has a significant impact on various fields of life, including human behavior and activities that are now highly dependent on modern technology.

Basic programming is one of the materials taught to class X SMK students in the skills program, both in semester 1 and semester 2. This subject is an important competency that helps students better understand basic programming at school and the world of work later (Patwiyanto, Wahyuni & Prasetyo, 2018). Basic programming subjects train students to think logically and systematically. According to Patwiyanto, computer programming is not a simple and simple thing. Computer programming is an activity that requires accuracy and willingness to work for a long time. In the TKJ department at SMKS Persiapan Pematang Siantar, this basic programming subject is studied by class X students in semester I and II. Basic programming is a subject that is difficult for students to understand. From some facts in the field, the learning outcomes of Basic Programming are low. Including the following facts about the mid-semester exam score data. The following is data on the value of the CBT Online Exam Patra-based mid-semester exam which was held on 14 to 22 September 2022:

Literature Review

Learning models evolve through a variety of different student characteristics. Since students have differences in personality, learning styles, and learning methods, learning models are not limited to a single approach. A learning model is a learning pattern that is illustrated from the beginning to the end of learning activities that are systematically arranged and used as guidelines in planning learning activities to achieve predetermined learning objectives (Purnaningsih, 2022).

Learning model refers to a strategy or format used to design curriculum (lesson plans), with the aim of increasing the effectiveness of teaching and learning activities (Fachrudin, Masitoh, & Nursalim, 2022). According to Sulistio & Haryanti, (2022), there are several variations of cooperative learning models, namely:

1. Team Game Tournament (TGT) type Cooperative Learning Model,
2. Student Team Achievement Division (STAD) type Cooperative Learning Model,
3. Problem Based Learning type Cooperative Learning Model,
4. Group Investigation (GI) type cooperative learning model.
5. Cooperative learning model type think pair share (TPS)
6. Numbered Head Together (NHT)
7. Make a match learning model
8. Rotating Trio Exchange type cooperative learning model

From the perspectives presented, it can be concluded that a learning model is a conceptual framework that describes a systematic model or procedure in organizing the learning process. The model also acts as a reference for teachers in planning and implementing learning activities.

4. Problem Based Learning Cooperative Learning

Cooperative learning is a teaching system that provides opportunities for students to work together with fellow students on structured tasks (Tukiran in Abdullah, 2017). Cooperative learning is a learning method in which active interactions occur between students and students, students and teachers, and students and their learning environment. Students learn together and ensure that each group member has fully mastered the material being studied (Suprihatin, 2017) . Based on the above views, it can be concluded that cooperative learning is a learning method in which students are grouped in a learning team with the intention that they work together to achieve understanding and completion of the assigned tasks.

Cooperative learning models are related to things that cause members to work together in completing group tasks that aim to arouse individual motivation to work together to achieve group goals (Abdullah, 2017) .

Problem Based Learning Model is a learning approach that uses real-world problems as a context for students to learn about critical thinking and problem solving skills, as well as to gain essential knowledge and concepts from the subject matter (Maryati, I. 2018). In the problem-based learning model, the teacher's role is to guide students through step-by-step learning activities to carry out investigations to solve a problem, and the teacher also develops the strategies and skills needed to solve the problem. These strategies include gathering information related to the question, synthesizing, and presenting their findings to others (Widodofindings to others (Widodo. S, 2016). So, through the application of cooperative learning methods in the form of Problem Based Learning, students are invited to think critically and work together in understanding the material provided. Problem-based learning is learning that involves students in solving problems by integrating various concepts and skills from various disciplines. This strategy includes gathering and integrating information, and presenting findings (Bern and Erickson in Tika, W. 2021).

This learning model is not only an effective environment for mastering specialized knowledge, but it can also help students develop lifelong skills in solving problems. Therefore, this Problem-Based Learning method is very suitable for use in learning mathematics which has an objective nature and is related to situations that occur in everyday life. (Anjani, N. D., Sulianto, J., & Untari, M. F. A. 2021).
The problem-based learning model refers to a series of learning activities that focus on the scientific process of solving problems. This model does not expect students to only listen, record, and memorize, but rather involves students actively in thinking, communicating, searching, and concluding. The main purpose of this learning activity is to solve problems. In other words, without a problem, the learning process is impossible, as this model uses problems as the key to learning. Problems in this context refer to situations that involve doubt, uncertainty, or difficulty that must be solved immediately (Rachmatika, R. V., 2022).

Thus it can be concluded, that in the concept of problem-based learning, this teaching approach encourages students to be actively involved in overcoming any challenges faced independently, based on their own knowledge and understanding. All of these views support the PBL model as the theory emphasizes that student learning involves an independent search for knowledge. This knowledge is obtained through finding information to solve problems related to learning materials. The characteristics of Problem Based Learning (PBL) are as follows:

a. Problems become the starting point in the learning process.
b. The problem discussed is a problem that exists in real life and is not structured.
c. This problem requires multiple perspectives.
d. The problem challenges students' knowledge, attitudes and competencies, requiring the identification of learning needs and new areas of learning.
e. The main focus is self-directed learning.
f. The use of multiple sources of knowledge, their use and evaluation of information are important processes in PBL.
g. Learning involves cooperation, communication and collaboration.
h. The development of inquiry and problem-solving skills is as important as the mastery of content knowledge to find a solution to a problem.
i. The open-ended process of PBL includes synthesis and integration of the learning process.
j. PBL involves evaluation and review of student experiences and the learning process (Amir, M. T., 2016).

From the properties mentioned above, it is clear that in the problem-based learning method, the learning process begins with a problem. The problem can be presented by students or teachers, and then students will develop their understanding of what they already know and what they need to know to be able to solve the problem. Students do a lot of activities that stimulate scientific thinking while solving problems, and the characteristics of problem-based learning (PBL) show how the application of learning in the classroom is oriented to problem-based learning (PBL).

Methods

This research is a research conducted in the classroom with the aim of improving student learning achievement in Basic Programming subjects in class X TKJ SMK Persiapan Pematang Siantar. The method used in this research is class action research, with the Problem Based Learning learning model. Classroom action research is research that aims to improve the process and results of student learning. Through this research, certain actions or treatments are carried out to improve the learning of a group of students.

This research consists of two stages, namely the preparation or pre-action stage, and the research action stage. Arikunto explained that classroom action research generally involves four stages, namely planning, action implementation, observation, and reflection. In this study, the classroom action research (PTK) cycle has the following steps:

The following is a description of the procedure for implementing the cycle of action:

Cycle

1. Planning

Action planning is carried out by researchers:

a. Researchers compiled a plan regarding the implementation of Basic Programming learning for class X TKJ students at SMK Persiapan Pematang Siantar as listed in the attachment.

b. Using the Problem Based Learning model as a solution to solving learning problems.

c. Creating learning scenarios which include: making lesson plans and Basic Programming materials basic competencies regarding the basic flow of programming.

d. Creating study groups.

2. Implementation of Action (Acting)

After the action planning has matured, the next step is to implement the plan in the classroom by referring to the Learning Implementation Plan that was previously prepared. At this stage, researchers will carry out actions in accordance with the plans that have been made, and observe all activities carried out by students during the learning process using the Problem Based Learning cooperative learning model. The implementation of this action is flexible and can be changed according to the situation, conditions, and needs that occur in the field. All changes that occur will be recorded in field notes.

3. Observing

The observation process is carried out during the learning process, so this stage goes hand in hand with its implementation. At this stage, activities include observing and recording all relevant information that occurs during the learning action. Everything that happens in the classroom during the learning process is recorded in the context of the application of the Problem Based Learning learning model, with the aim of improving student learning outcomes in Basic Programming subjects

4. Reflecting

In this step, researchers analyze the data obtained during observation and then reflect. Reflection is carried out through discussions between researchers and Basic Programming teachers involved. The reflection stage aims to evaluate the actions that have been taken based on the data collected, with the aim of improving the next action. If there are problems during reflection, a review process will be carried out through the next cycle so that the problems that arose in the previous cycle can be resolved.

D. Research Instruments

Research instruments are means or facilities used by researchers to collect data with the aim of facilitating the implementation of research and producing better, accurate, comprehensive, and systematic data. The selection and use of tools by researchers aims to make data collection activities more structured and easier to carry out.

1. Observation Sheet

In the Problem Based Learning learning model in Basic Programming Subjects, there is a stage called observation. Observation involves direct observation of objects and activities that occur during the implementation process of the learning model. In this case, the researcher acts as a teacher while the

subject teacher acts as an observer. Observation is done by observing student activities during the teaching process.

2. Documentation

Documentation refers to the recording, photograph, or drawing of an event that has happened before, in addition to the observations that have been made.

3. Test

To obtain information about student learning achievement, a tool called a learning test is used. This tool contains questions related to the learning material. In this case, the format chosen was multiple choice, and group assignment tests were conducted at the end of each learning cycle. The results of this test will be used as data on student learning achievement.

Result and Discussion

In Section IV, the researcher will explain the research results found. These results include an explanation of the data collected through interviews, observations, and documentation when collecting information in the field. In addition, the research results will be analyzed in the context of improving the basic programming learning outcomes of TKJ students.

The data generated in this research includes a description before the general data. General data that will be disclosed includes a description of the research location, namely SMK Persiapan Pematang Siantar which is located in Langkat district. Furthermore, the findings and analysis of research data will be discussed. The findings in this study were obtained through in-depth interviews with informants and observations of informants' interactions with their environment in order to collect the required data. In addition, a documentation study was also conducted. The results of this study are described in the form of descriptions and tables organized based on information obtained from the main informants and supporting informants.

1. Special Findings

a. Learning Outcomes Before Implementing the Problem Based Learning Model

Before applying the basic programming learning model in class X TKJ SMK Persiapan Pematang Siantar, the learning outcomes of students in the subject can be known by the researcher to students in the first meeting. The following is data on the value of the CBT Online Exam Patra-based mid-semester exam which was held on 14 to 22 September 2022:

Based on the results of the evaluation of mid-semester exam scores using the Online Computer-Based Testing (CBT) system from September 14 to 22, 2022, the data shows that out of a total of 20 students who took the exam in class X TKJ, none managed to reach the average KKM score (75). This finding indicates that student achievement in Basic Programming subjects is still relatively low. Therefore, further action is needed to overcome this educational phenomenon. Therefore, the researcher then took action using cycle I to improve student learning outcomes. The approach used is a problem-based learning model. Hopefully, this learning model can improve student learning outcomes in Basic Programming subjects.

1) Action Planning

In this planning phase, researchers planned steps to overcome the problem of low student learning outcomes in Basic Programming subjects. One of the steps taken by researchers is to apply the Problem Based Learning learning model. Based on the results of the previous Pre Test, researchers planned the following actions:

a. Develop a Learning Implementation Plan (RPP) for cycle I in accordance with the material to be taught.

b. Prepare Basic Programming teaching materials.

c. Prepare learning facilities that support the implementation of the learning process, such as student handbooks.

d. Creating an evaluation format for students' learning outcomes to evaluate their learning progress.

e. Prepare observation sheets to record student learning activities and observation sheets to record teacher activities.

2) Implementation of Action

Researchers carry out learning activities in accordance with the plan that has been prepared (RPP) and implement alternative solutions that have been made. The implementation of this activity was carried out in one meeting with a total duration of 80 minutes. At the first meeting, the learning activities carried out were:

a) Introduction Activity

At the initial stage of the activity, the researcher appercepted the material with various steps. The researcher greeted the students, asked how they were, and directed them to pray before starting the learning, led by one of the students. After that, the researcher checked the students' attendance and asked about their progress, provided reinforcement and connected it with the learning objectives of the day. Next, the researcher conveyed the learning objectives related to algorithms and C++ Programming.

b) Core activities

Learner Orientation

• Guidance is given to students so that they can observe, read, and convert back C++ algorithms and programming.
• Students get a source of display and reading related to the material of algorithms and C++ programming.
• The researcher displays the power point while giving explanations

Critical Thinking

• The researcher provides opportunities for students to ask questions to recognize things that are still not understood, starting from questions related to facts to questions that are hypothetical or propose hypotheses. These questions should still be related to the topic of algorithms and C++ Programming.

Collaboration

• The researcher guides students to form groups of 4 members.
• The researcher gave students a case assignment regarding the structure of C++ programs, flowcharts and algorithms in C++ Programming which must then be presented by each group.

Communication

• The researcher asked the students to present their work.

Evaluation

• The teacher distributes and asks students to work on the LKPD.
• The teacher asks for the problem sheet.
• Teacher and students make conclusions about algorithms and C++ Programming.

c) Closing activities

The implementation of learning closing activities is as follows:

Follow-up Plan

• Researchers provide opportunities for students who want to ask questions related to the material presented
• Reflection activity by asking

3) Observation

This observation activity aims to check whether the implementation of the teaching and learning process is in accordance with the previously prepared plan. The purpose of this observation is to obtain information about the suitability between what is planned and what is implemented. To evaluate the progress of each student in Cycle I, formative tests were conducted at the end of each cycle. The results of the formative tests were used to determine the success rate of the research in Cycle I.

the task with a percentage of 70%. Meanwhile, 6 students did not successfully complete the task with a percentage of 30%. The average class score was 72.5. Therefore, it can be concluded that the overall student learning completeness rate in cycle I was 70%. Next, the percentage of student learning completeness in Cycle I will be described.

Table 4.4

Percentage of Completion of Cycle 1 Test Learning Outcomes

NO.	Percentage Completeness	Completion Rate	Number of Students	Percentage Number of Students
1	90%-100%	Very high	2	10%
2	80%-89%	High	8	40%
3	70%-79	Medium	4	20%
4	55%-64%	Low	5	25%
5	0%-54%	Very Low	1	5%
Total			20	100%

From the table data presented, it can be seen that there are students with various assessments, both high and low. There were two students (10%) who had very high ratings, eight students (40%) with high ratings, four students (20%) with medium ratings, five students (25%) with low ratings, and only one student (5%) with very low ratings.

The results of classical student learning completeness were calculated using the formula set by Zainal Aqib, namely:

Based on the classical learning achievement of 70%, the success rate of student learning in cycle I can be categorized as moderate. This is in accordance with the criteria for the success rate of student learning that has been determined by Zainal Aqib, which is contained in the table below:

Table 4.5
Criteria for Student Learning Success Level in %

Level of Success (%)	Category
>80%	Very High
60-79%	High
40-59%	Medium
20-39%	Low
<20%	Very Low

From the explanation above, it can be concluded that the learning completeness in the first cycle was 70%, which is included in the high category. Nevertheless, students' learning outcomes in the first cycle had not reached the classical completeness level set at 85%. Therefore, the researcher will take additional steps to improve student learning outcomes in the Basic Programming subject. The research will be continued in the second cycle.

Before applying the Problem Based Learning Model (PBL) in basic programming subjects. From the results of the mid exam data obtained data that from a total of 20 students who took the exam in class X TKJ, none of them managed to reach the average KKM score (75). This finding indicates that student achievement in Basic Programming subjects is still relatively low, indicating a low level of learning success. In accordance with the standard level of learning success set by Zainal Aqib, the target student learning completeness rate is 85%.

4.1 Student Learning Outcomes After Applying the Problem Based Learning Model

In the first cycle, the application of the Problem Based Learning (PBL) Learning Model was carried out. From the results of the first cycle test, it was found that 14 students out of a total of 20 students successfully completed the task with a percentage of 70%. Meanwhile, 6 students did not successfully complete the task with a percentage of 30%. The average class score was 73.5. Thus, it can be concluded that the overall student learning completeness rate in the first cycle was 70%, which is still included in the moderate category. Nevertheless, students' learning outcomes in the first cycle had not reached the classical completeness level set at 85%.

After analyzing the results of the first cycle, the researcher reflected with the teacher observer to identify the weaknesses and shortcomings that occurred in the cycle. There were several things that needed to be improved, both in terms of researchers and students. In terms of the role of the researcher, it is necessary to improve understanding of class dynamics, be more careful in choosing group members, provide clearer explanations of the material, and understand the potential of students better. Meanwhile, in terms of students, there were students who lacked discipline when the researcher explained the material and students who were not willing to work together in investigating the material in groups.

As a follow-up, the implementation of the second cycle was carried out with the planned improvement steps. In the second cycle, changes were made to the Learning Implementation Plan (RPP), the groups used, classroom management strategies, student worksheets, evaluation tests, and tools and materials that support the learning process. In the second cycle, data was obtained that 16 students out of a total of 20 students successfully completed the assigned tasks or materials, or about 80%. The average class score was 82%. Thus, overall, the percentage of classical student learning completeness in the second cycle was 80%. This result showed a significant improvement compared to the first cycle. The conventional learning achievement assessment of 80% in the second cycle was classified as very high. Based on these results, it can be concluded that the level of achievement of classical learning completeness in the second cycle was 80%.

Then for the sake of creating long-term changes in students, the research was continued to cycle III. has met the standard of completeness of learning outcomes set by Zainal Aqib of 85%. In the third cycle, data was obtained that 18 students out of a total of 20 students successfully completed the assignment or material provided, or around 90%. The average class score was 84.75 Thus, overall, the percentage of classical student learning completeness in the third cycle was 90%. This result showed a significant improvement compared to the first and second cycles. The conventional learning achievement assessment of 90% in the third cycle was classified as very high.

Thus, the Problem Based Learning (PBL) Learning Model has successfully improved student learning outcomes in basic programming subjects. Student responses to the PBL learning model also showed an increase, such as the spirit of cooperation in solving problems, activeness in learning, active discussion with friends, and clear delivery of ideas or opinions. Based on the results of this study, it can be concluded that the application of the Problem Based Learning (PBL) Learning Model has a positive effect on student learning outcomes in basic programming subjects. This increase in learning outcomes can be used as a reference in developing more effective and enjoyable learning methods to achieve student learning completeness.

4.2. Students' Ability After Going Through Three Cycle Stages Using the Problem Based Learning Model

After applying the Problem Based Learning (PBL) learning model in Basic Programming subject, students in grade 10 TKJ experienced a significant improvement in their learning outcomes. With PBL, students are actively involved in solving real problems relevant to programming. They learn through hands-on experience in designing, implementing and testing their own solutions. PBL allows students to develop a deeper understanding of programming concepts, as they see how these concepts can be applied in real situations. In addition, through group work and discussion, students also develop important collaboration and communication skills. Thus, after implementing PBL, grade 10 TKJ students not only improved their understanding of programming concepts, but also developed better problem-solving skills and increased their motivation and interest in learning. PBL provides a more

interesting, relevant and meaningful learning experience for students, helping them to become more competent programmers who are ready to face the challenges of the digital world. Here are some of the improvements experienced by students after applying the PBL model:

a. Improved Problem Solving Ability: By applying the Problem Based Learning (PBL) learning model, grade 10 TKJ students have improved their practical problem-solving skills in basic programming. They learn to identify problems, analyze situations, and design effective solutions. Through collaboration in groups, students honed their ability to formulate strategies and implement concrete steps to overcome the programming challenges they faced.

b. Development of Concept Application Skills: In the PBL model, students are given real problems that they have to solve using basic programming. This process allows students to apply the concepts they learn directly in a practical context. They learn to connect theory with practice, reinforcing their understanding of programming concepts and testing their ability to apply them appropriately.

c. Increased Creativity in Programming: Through PBL, Grade 10 TKJ students are encouraged to develop creative solutions to programming problems. They are encouraged to think outside the box, seek innovative approaches and come up with unique solutions. In this process, students not only learn about programming syntax, but also how to creatively utilize those concepts to achieve the desired results.

d. Improved Ability to Collaborate: PBL promotes collaboration between students in small groups. Through this cooperation, students learn to share ideas, discuss, and support each other in solving programming problems. They learn to listen to others' perspectives, contribute in teams, and resolve conflicts constructively. With improved collaboration skills, students can face programming challenges more efficiently and effectively.

e. Improved Communication Skills: During the PBL process, Grade 10 TKJ students are invited to present their solutions to the group and the class as a whole. This involves developing effective communication skills, both oral and written. Students learn to communicate their ideas, explain the algorithms and programming they use, and present their work in a clear and structured manner. This improvement in communication skills contributes to their ability to better convey ideas and solutions in a real programming environment.

Conclusion

The Problem Based Learning (PBL) learning model brings positive changes in the learning outcomes of grade 10 TKJ students in Basic Programming subject. By applying PBL, students can improve concept understanding, develop collaboration skills, and hone problem solving skills. The implementation of PBL allows students to experience more meaningful and relevant learning, preparing them to become competent and innovative programmers in the future.

Based on the research results in Chapter IV, the following conclusions can be drawn:

1. Before applying the Problem Based Learning model, the learning outcomes of students in class X TKJ SMK Persiapan Pematang Siantar were still low. Out of 20 students, only 4 students successfully completed the material, so the percentage was only 20%. Meanwhile, 16 other students could not complete the material with a percentage of 80%. The average score of the class was 55.75%.

2. After applying the Basic Programming learning model, there was an improvement in the learning outcomes of students in class X TKJ SMK Persiapan Pematang Siantar. In cycle I, out of 20 students, 14 students or 70% successfully completed the material, while 6 students or 30% could not complete the material with an average class score of 73.2. In cycle II, out of 20 students, 16 students or 80% successfully completed the material, while 4 students or 20% could not complete the material with a class average score of 82. Then in cycle III, out of 20 students, 18 students or 90% successfully completed the material, while 2 students or 10% could not complete the material with a class average score of 84.75. thus, there was an increase in student learning outcomes which included a very high category. This shows that in cycle III, students' learning outcomes have reached the 85% classical completeness level set by Zainal Aqib. .

3. After using the Problem-based learning cooperative learning model, students showed positive responses. They were able to investigate and find answers to the problems in the given material. Students were also active in asking questions and responding to other groups' presentations, as well as actively discussing with their friends about the material.

References

Abdullah, R. (2017). "The effect of applying the *Problem Based Learning* type cooperative *learning* model on chemistry subjects at madrasah aliyah". *Lantanida journal*, *5*(1), 13-28.

Amijaya, L.S, Ramdani, A & Merta, I.W (2018), "The effect of guided inquiry learning model on learning outcomes and critical thinking skills of students", *Journal of Pijar Mipa*, 13(2), 94-99.

Angelina, L. (2022). "Efforts to improve student learning outcomes on the material of rows and series through the application of *Problem Based Learning learning* model in Class VIII-2 SMP Negeri 2 Padangsidimpuan" (Doctoral dissertation, IAIN Padangsidimpuan).

Anjani, N. D., Sulianto, J., & Untari, M. F. A. (2021). Improving Learning Outcomes of Fraction Materials by Applying Problem Based Learning Model with Manipulative Media. Journal of Education Action Research, 5(2), 246-253.

Aqib, Z., & Chotibuddin, M. (2018). Theory and Application of Classroom Action Research: (PTK). Deepublish.

Arifin, Z. (2022). Learner Management as an Effort to Achieve Educational Goals. Dirasat: Journal of Management and Islamic Education, 8(1), 71-89.

Arikunto, S. (2021). Classroom action research: Revised edition. Bumi Aksara.

Awal, Y. (2022). "Improving Students' Mathematics Learning Outcomes by Using *Problem Based Learning* Cooperative *Learning* Model on Matrix Material". JIMAT: Scientific Journal of Mathematics, 3(1), 9-14.

Fachrudin, A. Y., Masitoh, S., & Nursalim, M. (2022). "Mathematics Learning Model in the Perspective of Philosophy of Education (An Axiological Study)". *JUPE: Journal of Mandala Education*, *7*(4).

Ghazali, I. F. (2018). "Learning Media Development Using Lecture Maker Software on". *Education*, 77-86.

Hasbullah, H. (2022). The Concept of Character Education of Nahdlatul Ulama (NU). Journal of Islamic Education Studies, 43-57.

Jamun, Y. M. (2018). The impact of technology on education. Missio Journal of Education and Culture, 10(1), 48-52.

Jihad, Asep, Haris, Abdul, Learning Evaluation (Yogyakarta: Multi Prasindo, 2012).

Maryati, I. (2018). Application of problem-based learning model on number pattern material in class vii junior high school. Mosharafa: Journal of Mathematics Education, 7(1), 63-74.

Nurrita, T. (2018). "Development of learning media to improve student learning outcomes." MISYKAT: Journal of Al-Quran, Hadith, Shari'ah and Tarbiyah Sciences, 3(1), 171

Parnawi, A. (2019). *Psychology of learning*. Deepublish.

Patwiyanto, Wahyuni S, Prasetyo. 2018. *Basic Programming SMK / MAK Class X.* I, 1st Published.

Permana, N. (2017). "Efforts to Improve *Learning* Outcomes of Biology Science Material Properties of Substances and Changes in the Form of Substances with the Application of the Game Technique '*Problem Based Learning*' in Class Vii-E Students of Smp Negeri 220 West Jakarta". Profesi: Journal of Education and Teacher Science, 6(2), 25-38.

Purnaningsih, P., Sukmawati, N. N., & Isnaeni, R (2022). "The Application of Role Play in Basic English Conversation for Children of Griya Yatim Dhuafa Permata Pamulang". *Journal of Community Research and Service*, *6*(2), 148-154.

Putra, A. (2021). "Application of *Problem Based Learning* Cooperative *Learning* Model for Elementary School." Jakad Media Publishing.

Rachmatika, R. V. IMPROVEMENT OF STUDENT PROBLEM SOLVING SKILLS THROUGH THE APPLICATION OF PROBLEM BASED LEARNING MODEL THEME 6 ON SOCIETY MATERIALS FORMS OF MAN'S INTERACTION WITH THE ENVIRONMENT AND ITS INFLUENCE CLASS V SD NEGERI KEREO 05 CIPADU KOTA TANGERANG (Bachelor's thesis, Jakarta: FITK UIN Syarif Hidayatullah Jakarta).

Sanjaya, R. (2006). Creating Commercial Catalogs with Flash 8. Elex Media Komputindo...

Saragih, R. R. (2016). *Programming and Programming languages*. Office Automation Practice.

Suprihatin, S. (2017). "The Effect of *Problem Based Learning* Model *on* Learning Outcomes." *Education*, 84-94.

Sulistio, A., & Haryanti, N. (2022). *Cooperative Learning Model.*

Susilo, H., Chotimah, H., & Sari, Y. D. (2022). Classroom action research. Media Nusa Creative (MNC Publishing).

Syarifudin, A. S. (2020). Implementation of online learning to improve the quality of education as an impact of social distancing. Journal of Indonesian Language and Literature Education Metalingua, 5(1), 31-34.

Tika, I. N., & Agustiana, I. G. A. T. (2021). The Effect of a Blended Learning Project Based Learning Model on Scientific Attitudes and Science Learning Outcomes. Scientific Journal of Elementary School, 5(4), 557-566

Utrifani, A., & Turnip, B.M. (2014). The Effect of Problem Based Learning Model on Student Learning Outcomes on the Subject Matter of Straight Motion Kinematics

Walid, A. (2017). The effect of problem based learning (PBL) on problem solving skills and cognitive learning outcomes of students of SMA Negeri 10 Bengkulu City. Educative: Journal of Education Science, 3(3), 717-727.

Widodo, S. (2016). Development of critical thinking skills of students by using a problem-based learning model through socio-economic issues after the Jatigede Reservoir inundation in social studies learning at SMPN 2 Wado Sumedang Regency class VIII C. International Journal Pedagogy of Social Studies, 1(2), 275-288.

Yayan Alpian, M. S. (2019). "The Importance of Education for Humans". *Education*, 67-72.