

DEVELOPMENT OF PROBLEM BASED LEARNING MODEL ASSISTED OF QUIZIZZ ON ECONOMIC SOCIAL STUDIES AT JUNIOR HIGH SCHOOLS

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Abstract

Problem Based Learning is a suitable educational model for the complex economics social studies. However, in practice, teachers in schools seldom develop this model to meet the unique characteristics and learning needs of students. Additionally, the implementation of interactive learning media is also crucial to increase the effectiveness of the model. Based on the reasons, this study attempts to develop the implementation of Problem Based Learning model supported by Quizizz on economics social studies in junior high schools. This study used a qualitative approach by Research and Development (R&D) method through the 4D research stages (define, design, develop, and disseminate). This study was conducted at National JHS 32 Semarang, focus on the 9th grade. The limited experiment was done in a class with 30 students and the next experiment was done in two class which also have 30 student each. The instruments in this study include observations, interview, and questionnaires. In addition, the validity of data is tested using the data triangulation techniques. The research finding focused on developing the Problem Based Learning syntax and integrating the Quizizz as an auxiliary model. According to the validity questionnaire assessment, the average feasibility assessment for development products was 91% (Very Good) and 9% (Good). Meanwhile, student satisfaction responses to development were 98% (Strongly Agree) and 2% (Agree). Thus, the Problem Based Learning model assisted by Quizizz was declared worthy of dissemination. Based on the finding of this study, the use of the Problem Based Learning Model assisted by Quizizz needs to be adjusted to the students' characteristics and learning needs in order to maximize the learning outcomes. Besides, the teachers could redevelop the research products by integrating other interactive learning media to boost the effectiveness of the Problem Based Learning model.

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INTRODUCTION

Quality learning is expected to have a good effect on improving student learning outcomes in the classroom (Anwar & Jurotun, 2019). The purpose of assessing learning outcomes is to find out whether the material taught has been absorbed properly or not. Thus, teachers can measure how far the learning objectives have been achieved and the level of satisfaction with the expected learning (Safitri & Edie, 2020). Student understanding is also strongly influenced by the breadth or difficulty of the subject matter. The more extensive or difficult the material studied, the greater the effort that teachers and students must make in order to get satisfactory learning results.

One of the subjects rich in breadth of material is economic social studies. This is because social studies subjects require a student-oriented learning process, especially emphasizing the competence of 4C skills (Creativity, Critical thinking, Collaboration, and Communication) of the 21st century in solving social problems to provide maximum results (Vistara et al., 2022). With these skills teachers can encourage students' standards of creativity, critical thinking skills, collaboration and communication through Problem Based Learning (Amalia et al., 2019).

Problem Based Learning is one of the learning models most recommended by Ministry of Education (*Kemendikbud*) in the current independent curriculum because it is based on contextual learning. Contextual learning in Problem Based Learning has a great influence on improving 4C skills that require real experiences for students to facilitate understanding and provide meaningful learning (Wynn, 2022). In line with the results of research by Meyer et al. (2023) showed that 4C skills were developed after applying learning based on the Problem Based Learning model. This means that the Problem Based Learning model is very effective for learning economic social studies today and for the future.

According to Ulutas (2023) Problem Based Learning is a student-centered learning model so that teachers need to encourage students to be able to solve learning problems with full motivation and independence. In this model, students are required to investigate the problem more deeply before providing a problem-solving solution (Maxwell, 2020). According to Lambert & Ashwin (2021), the problems that students find serve as a stimulus or focus for applying skills problem solving and reasoning and then students search for the right information or knowledge to solve the problem.

In fact, the Problem Based Learning model is still rarely used in the learning process. Especially at junior high school level. Some social studies teachers often find it difficult to apply the Problem Based Learning model that is often not as expected. Some problems that often occur are teachers run out of time teaching time due to the syntax Problem Based Learning syntax is long, no available supporting learning media, the level of difficulty of the material and assignments does not match the ability of students, and so on. This problem arises due to the absence of Problem Based Learning model development. Learning model that is relevant with the characteristics of students and their learning needs.

From the initial observation at National JHS 32 Semarang, it was found that from 2021 to 2023 the number of lesson plans/teaching modules that used the Problem Based Learning model was only around 14 times. This figure is very small when compared to the number of social studies lesson hours (JP) meetings in class VIII Junior High School, which is 164 JP. Based on the results of the interview, the application of the Problem Based Learning model requires a long-time allocation, students are less interested in the problems given, students lack confidence in expressing their opinions, and so on. The need for the development of the Problem Based Learning model is also reinforced by data on the learning outcomes of economic social studies students National JHS 32 Semarang in 2023-2024 which are still

unsatisfactory. From a total of 272 students in class VIII, about 95 students were able to reach the completion criteria while 177 other students reached the minimum completion criteria after passing remedials.

The Problem Based Learning model can be combined and developed using various learning media. This model tends to be flexible to combine because the steps in learning can adopt various media as problem solving tools (Agung et al., 2023; Ahmad & Hartono, 2020). One learning media that is suitable for use is Quizizz. Quizizz was originally a game-based interactive learning media. Then, this media continues to be developed so that it has features that can replace the role of more complex learning media such as presentations, Student Worksheets (LKPD), and learning assessments.

Research by Yuningsih et al. (2024) stated that the Problem Based Learning model paired with interactive learning media proved to be effective in training and improving students' problem-solving skills and interest in learning. This research was supported by Maftukhah et al. (2024) which shows that there is a positive effect of Problem Based Learning-based learning assisted by Quizizz on problem solving skills. The integration of Problem Based Learning and Quizizz provides its own learning meaningfulness for students. In addition, research by Nalurita et al. (2019) shows that optimizing problem solving can be done using the Problem Based Learning model assisted by interactive media. Then, research by Arif et al. (2019) concluded Problem Based Learning combined with interactive learning media can attract students' attention and make it easier for students to understand abstract concepts.

METHOD

The research method used is research and development. The approaches used in this research are qualitative and quantitative. The qualitative approach is useful for explaining and describing the process of developing a conventional Problem Based Learning model into Problem Based Learning assisted by Quizizz. This research was also strengthened by a quantitative approach through calculating questionnaire scores in the preliminary study. The research and development model used is 4D (Define, Design, Develop, and Disseminate) by Thiagarajan. Products developed in this model are product design, teaching modules, and guidelines for using the model.

The research was conducted at National JHS 32 Semarang in class VIII which is located at Jl. Ki Mangunsarkoro No.1, Karangkidul, Central Semarang Sub-district, Semarang City, Central Java, 50136. The sources of data in this study were practitioner teachers and students of class VIII. Data were collected through the instruments of observation sheets, interviews, questionnaires, and documentation studies. The data obtained were tested for validity using triangulation techniques. The triangulation technique performed was divided into data triangulation and source triangulation to test the credibility of the data. Then, the data was analyzed qualitatively descriptively continuously until the data was saturated. The stages of data analysis in this research include: data collection, data reduction, data presentation, and conclusion drawing.

RESULT AND DISCUSSION

Social studies learning carried out at National JHS 32 Semarang has implemented an independent curriculum since the academic year 2022/2023 odd semester. Indicators to measure the success of economic social studies learning used are the presentation of material / problems, student-centered learning, problem solving, and learning outcomes. The results of distributing factual questionnaires obtained the following data: (1) Presentation of material / problems in social studies learning that has been implemented is in the interval 13 - 16 with an

average score of 16 with a good category, (2) Student-centered learning is in the interval range 17 - 20 with an average score of 17 with a very good category, (3) Problem solving is in the interval range 14 - 16 with an average score of 15.6 with a good category, (4) Learning outcomes are in the interval range 13 - 16 with an average score of 15.8 with a good category. Overall, can be seen in the following figure:

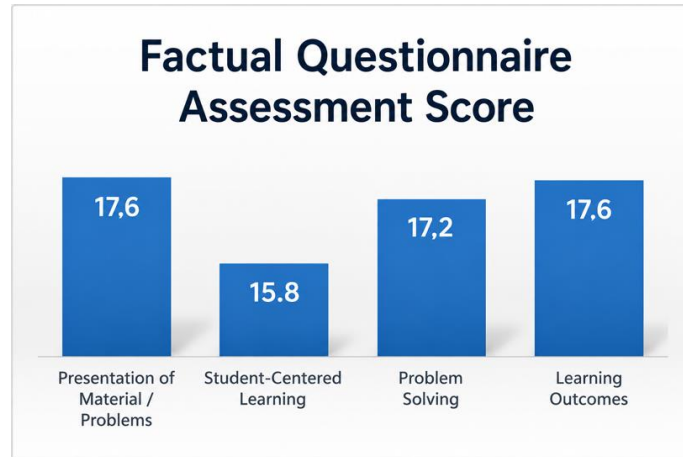


Figure 1. Diagram of actual questionnaire score
Source: Data processed by researchers, 2024

The diagram above shows that the average total score given by respondents is in the range of 15.6 - 17 with an interval of 1.4 average points. This means that there is a significant difference in the achievement of indicators from the implementation of learning in schools. Achievement of scores in the excellent category occurs in the indicator of student-centered learning. While the other indicators are only in the good range. All respondents agreed that improvements are needed in economic social studies learning in increasing participation, activeness, creativity and problem solving.

Then to see the aspects of development that are needed, a development needs analysis questionnaire was distributed. The data obtained are as follows: (1) Presentation of material / problems is in the interval 17 - 20 with an average score of 17.6 with a very important category, (2) Student-centered learning is in the interval range 13 - 16 with an average score of 15.8 with an important category, (3) Problem solving is in the interval 17-20 with an average score of 17.2 with a very important category, (4) Learning outcomes are in the range 17-20 with an average score of 17.6 with a very important category. Overall, can be seen in the Figure 2.

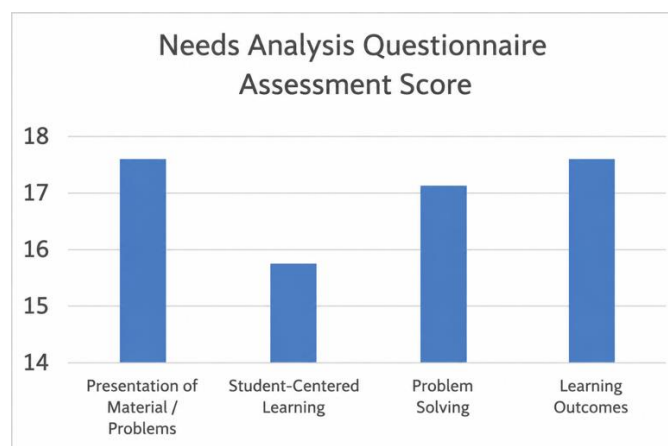


Figure 2. Diagram of needs analysis questionnaire

Source: Data processed by researchers, 2024

The diagram above shows that the average total score given by respondents is in the range of 15.8 - 17.6 with an interval of 1.8 points. Student-centered learning is classified as important. While other indicators are in the very category. Where this is inversely proportional to the factual questionnaire assessment score. This means that the development that needs to be done is in accordance with the current learning conditions in the field. Respondents emphasized more focused development on indicators that have not been indexed very well, namely on the presentation of material / problems, problem solving, and learning outcomes.

From the results of the questionnaire distribution, the researcher designed the design of Problem Based Learning Assisted by Quizizz based on the results of factual questionnaires, needs analysis questionnaires, interviews, observations, and documentation studies. Researchers analyzed the Problem Based Learning model that had been implemented needed to be developed by overhauling the syntax of the model to be more relevant to the level of education and student needs. The development is divided into 3 main stages, namely teaching preparation, learning implementation, and evaluation.

In the preparation stage of teaching, it is first necessary to dissect the learning outcomes that have been determined by KEMENDIKBUD to get achievements that are in accordance with the learning material taught, namely international trade. Then these achievements are derived into learning objectives in the teaching module which are used as a benchmark for the learning process being carried out. Learning objectives are adjusted to the use of Quizizz and complemented by independent curriculum learning, namely the Pancasila Student Profile (P3), Social Emotional Learning (PSE), Culturally Responsive Teaching (CRT) approach, and differentiated learning.

In the learning implementation stage, researchers developed the syntax of the Problem Based Learning model which should consist of five steps, namely (1) orienting students to the problem, (2) organizing students to learn, (3) guiding individual and group investigations, (4) develop and present results, and (5) analyze and evaluate the problem solving process adjusted (1) develop & present results and (2) analyze & evaluate the problem solving process. In the syntax, researchers try to make it easier for students by breaking down the syntax into (1) presenting results, (2) discussion of results and questions and answers, and (3) analyzing and evaluating the problem-solving process. This adjustment is based on experience, the teacher found it difficult to get an interactive learning process because not all students were able to dialogue in every LKPD presentation session.

In the final evaluation stage of the design, the researcher corrects any learning deficiencies that have been implemented to achieve the expected learning objectives. In addition, the teaching module is also equipped with several components, namely cover, author's identity, module information, learning steps, bibliography, assessment, assessment rubric, and other attachments.

Limited trial on 1 class of 30 students using the material "International Trade". Where students are divided into groups of 6 people/group to work on the assignments given. The expanded trial was conducted in 2 classes with a total of 60 students. The trials were still conducted in groups with the number of students adjusting to the number of students in the class. The syntax changes made proved to be able to facilitate researchers in organizing and supervising student work. The focus of students becomes more focused with the use of Quizizz media which is able to represent the teacher's work in explaining the material and replacing paper LKPD media. Teachers also find it easier to assess students cognitively with the Quizizz assessment which automatically provides an assessment score for completing the assignments given.

Product feasibility is measured from validation results or the feasibility of development products that have undergone improvements from input from all validators. The final validation or feasibility results are as follows.

Table 1. Feasibility validation results

Aspect	No	Observation Result			
		SB	B	TB	STB
Presentation	1	100%	-	-	-
	2	100%	-	-	-
	3	83%	17%	-	-
	4	100%	-	-	-
	5	83%	17%	-	-
Contents	6	83%	17%	-	-
	7	100%	-	-	-
	8	83%	17%	-	-
	9	83%	17%	-	-
	10	100%	-	-	-
Average		91%	9%	-	-

Source: data processed by researchers, 2024

The average of each criterion listed on the development product was 91% stated that it was Very Good (SB) and 9% of the criteria were stated as Good (B). There were no respondents who chose the feasibility scale of Neither Good (TB) nor Very Bad (STB) on the criteria of the final product development aspect. This means that this final product can be said to be very feasible to be disseminated without significant improvement.

This feasibility data is reinforced by the results of student satisfaction response questionnaires during limited trials and expanded trials. the average satisfaction response score on the limited trial was 89% choosing Strongly Agree (SS) which rose to 98% after the expanded trial. Then in the limited trial students chose the Agree (S) criteria as many as 11% of students dropped to 2% during the expanded trial. While on the Disagree (TS) and Strongly Disagree (STS) scale, no students chose or 0%. Thus, the Problem Based Learning model assisted by Quizizz is declared feasible and ready for dissemination.

Economic Social Studies Learning That Has Been Applied

Economic Social Studies lessons at National JHS 32 Semarang are aimed at helping students develop a deeper understanding of the knowledge, skills and attitudes towards the socio-economic environment around them. The development of the Problem Based Learning model is also a more effective solution to solve the teacher's problem in implementing Problem Based Learning which has often run out of teaching time so that it must improvise. Where improvisations made such as summarizing the syntax and continuing the assignment independently at home are not effective in achieving the objectives.

The use of learning support media is also needed to stimulate students' critical thinking skills. In line with the opinion of (Santoso et al., 2023) learning activities carried out with the help of sophisticated media can increase the learning effectiveness of the Problem Based Learning model. Of course, this condition cannot be separated from the influence of the rapid development of information technology in the era of globalization in the world of education. In fact, teachers rely more on the package books that have been given from KEMENDIKBUD. In line with the opinion by Poluan et al., (2023) which states that teachers rely on student package books or teaching materials that are already available or by other teachers rather than creatively creating their own teaching materials.

The integration of technology into the learning process is an important innovation for model development. in the research of Indriani et al., (2022); Putri & Hamimah, (2023) learning models and learning media can help teachers in facilitating the learning process. Technology-based learning innovations in the form of learning media are very potential at National JHS 32

Semarang. This factor is supported by learning facilities at National JHS 32 Semarang which are qualified including: projectors, internet, computers, and so on.

Development of Problem Based Learning Model Assisted by Quizizz on Economic Social Studies Subjects

The research development made is oriented towards learning needs based on the results of factual questionnaires and needs analysis questionnaires in the research results. Educators must be able to understand learning methods related to learning models and understand effective teaching methods that their students really need (Khoiro et al., 2023). Based on the results of the development of the Problem Based Learning model assisted by Quizizz, there are two important focuses, namely adjusting the Problem Based Learning syntax and integrating Quizizz in the stages of the developed model.

At the stage of adjusting the Problem Based Learning syntax, the researcher examines more deeply the process and difficulties of each step of the conventional Problem Based Learning model. This aims to be the basis for adjusting the syntax in accordance with the characteristics and learning needs of the research subjects, namely class VIII students at National JHS 32 Semarang. Meanwhile, in the integration stage, Quizizz functions as a technological aid in each adjusted Problem Based Learning syntax. In line with research by Panggabean & Sinambela (2023) shows that Quizizz media is able to improve problem solving abilities in the Problem Based Learning model. Other research results are also shown by (Yuliana & Winanto, 2022) the use of Quizizz in the Problem Based Learning model improves learning outcomes and student cooperation.

Feasibility of Problem Based Learning Model Assisted by Quizizz on Economic Social Studies Subjects

The application of the Problem Based Learning model has been proven to have a significant impact on critical thinking skills in economic social studies subjects. This is because the Problem Based Learning syntax can orient students to the problem, organize students to learn, support independent group investigations, prepare presentations, and present the results of problem-solving work that has been made. In line with the opinion of Nurjanah (2018) which states that social studies lessons should be applied using a problem-based learning approach and using a constructivism framework to create a pleasant learning atmosphere with the learning experience gained. The effect of the Problem Based Learning model on economic social studies learning is an important topic to research because the Problem Based Learning recommended by the independent curriculum (Hutami et al., 2023).

The feasibility of the Problem Based Learning model assisted by Quizizz is measured by the validity of the product by expert lecturers and practicing teachers and student satisfaction with learning. Validators gave positive responses to the developed model. Based on the validator's assessment, overall, the teaching module has met the learning needs and objectives, learning instructional analysis, learning and context analysis, formulating specific objectives, assessment instruments, developing learning strategies, and so on.

On the other hand, students also responded positively to the implementation of the learning process. This model stimulates students to compete both individually and in groups to work on problems as well as possible in a fast time. In line with the results of Dewi et al. research, (2022) which states that the Problem Based Learning model assisted by Quizizz has been able to create student learning interest and improve problem solving skills.

CONCLUSION

This study successfully developed a Problem Based Learning (PBL) model assisted by Quizizz for Economic Social Studies at the junior high school level through the 4D development framework. The developed model adapts the conventional PBL syntax to students' characteristics and learning needs while integrating Quizizz as an interactive learning medium to support problem-solving activities, classroom engagement, and learning assessment. The validation and implementation results indicate that the developed model is feasible for classroom application and is well accepted by both experts and students, demonstrating its potential to improve the effectiveness of Economic Social Studies learning.

The findings contribute to the growing body of knowledge on technology-integrated problem-based learning by demonstrating that adapting PBL syntax to the educational context, rather than merely adopting the standard model, can enhance its practicality and implementation. Practically, the developed model provides teachers with an alternative instructional framework that combines student-centered learning with interactive digital media, enabling more engaging, efficient, and meaningful learning experiences.

This study has several limitations. First, the development and field testing were conducted in a single junior high school, limiting the generalizability of the findings to other educational contexts. Second, the study primarily focused on product feasibility and user responses rather than measuring long-term impacts on students' academic achievement, critical thinking, or problem-solving skills. Third, the integration was limited to the Quizizz platform, while other digital learning technologies were not explored.

Future research should evaluate the effectiveness of the developed model through experimental or quasi-experimental designs involving larger and more diverse samples across different schools and educational levels. Further studies are also encouraged to compare Quizizz with other interactive learning platforms, investigate its long-term effects on students' higher-order thinking skills and learning outcomes, and examine how the model can be adapted to different subjects and curriculum contexts to strengthen technology-enhanced problem-based learning.

REFERENCES

- Agung, G. H., Amalia, I. R., Faizah, N. A., & Ardiansyah, A. S. (2023). "Problem Based Learning Assisted by Scratch Nuanced Ethnomathematics of Semarang City Cultural Heritage on Students' Critical Thinking Ability". *PRISMA, Proceedings of the National Seminar on Mathematics*, 6(2022), 670–675. <https://journal.unnes.ac.id/sju/index.php/prisma/>
- Ahmad, E. Z., & Hartono, H. (2020). "Development of Physics Pocket Book Based on Problem Based Learning to Improve Understanding of Physics Concepts in Grade XI". *UNNES Physics Education Journal*, 9(3), 264–275. <http://journal.unnes.ac.id/sju/index.php/upej>
- Amalia, N. R., Rochmad, & Kharis, M. (2019). "Effectiveness of Mathematical Creative Thinking Ability of Grade VII Students in Problem Based Learning". *PRISMA Proceedings of the National Seminar on Mathematics*, 2, 185–189.
- Anwar, K., & Jurotun, J. (2019). "Improving the Activity and Learning Outcomes of High School Students in the Third Dimension Through PBL Learning Model Assisted with Props". *Kreano, Journal of Mathematics*, 10(1), 94–104. <https://doi.org/10.15294/kreano.v10i1.19366>

- Arif, D. S. F., Zaenuri, & Cahyono, A. N. (2019). "Analysis of Mathematical Critical Thinking Ability in the Problem Based Learning (PBL) Model Assisted by Media Learning Classroom". *Interactive and Google Proceedings UNNES Postgraduate National Seminar*, 323–328.<https://proceeding.unnes.ac.id/snpasca/article/view/594>
- Dewi, Dewa Ayu Widya Trisna, I Made Sila, & Karang Widiastuti, N. L. G. (2022). Model Assisted by Quizizz Application on Problem Solving Ability of Elementary School Students in Gugus VII Ubud District". *Widya Accarya*, 13(2), 145–152.<https://doi.org/10.46650/wa.13.2.1278.145-152>
- Hutami, T. S., Nugroho, A., & Anis, F. (2023). "Bibliometric Analysis: Research Trends on the Effect of Problem Based Learning Model on Critical Thinking Skills in Social Studies Learning". 8 (9), 279–292.
- Indriani, L., Haryanto, H., & Gularso, D. (2022). "The Impact of Problem Based Learning Model Assisted by Quizizz Media on Students' Critical Thinking Ability". *Journal of Educational Research and Development*, 6(2), 214–222.<https://doi.org/10.23887/jppp.v6i2.48139>
- Khoiro, D., Suryani, R., Yulianti, A., Mulyani, S. T., Samsiah, A., & Haryono, H. (2023). "Utilization of Quizizz Application as a Problem Based Learning Media for 12th Grade Social Studies Students at SMAN 1 PAMARAYAN". *Edu Sociata (Journal of Sociology Education Sociology)*, 6(2), 993–1001.<https://doi.org/10.33627/es.v6i2.1546>
- Lambert, C., & Ashwin, P. (2021). "Using Student Feedback to Reflect on Authentic PBL (aPBL) in Undergraduate Engineering Education". *Journal of Problem - Based Learning*, 8(1), 4–2.<https://doi.org/10.24313/jpbl.2020.00311>
- Maftukhah, L., Zaenuri, & Waluya, B. (2024). "Systematic Literature Review: Problem Based Learning (PBL) with Nuances Quizizz-assisted Ethnomathematics on Students' Problem Solving Ability. PRISMA, *Proceedings of the National Mathematics*, 7, 784–792.<https://proceeding.unnes.ac.id/prisma>
- Maxwell, B. R. (2020). "Problem-Based Learning (PBL) in a Grade 11 World History Class: Trials, Tribulations, and Triumphs". *Journal of Problem-Based Learning*, 7(1), 11–20.<https://doi.org/10.24313/jpbl.2020.00248>
- Meyer, G. S., Reigstad, I., & Serikova, L. (2023). "Students in Early Childhood Teacher Education and Their First Experience With Problem-Based Learning: A Comparative Study From the Perspective of Students in Kyrgyzstan and Norway". *Journal of Problem Based Learning in Higher Education*, 11(3), 25–43. <https://doi.org/10.54337/ojs.jpblhe.v11i3.7527>
- Nalurita, B. R., Nurcahyono, A., Walid, & Wardono. (2019). "Optimizing Mathematical Problem Solving in Problem Based Learning (PBL) Assisted by E-Comic Math". *PRISMA: Proceedings of the National Seminar on Mathematics*, 2, 395–402.
- Nurjanah, S. (2020). "JuJournal of Pedagogics and Educational Dynamics. Social Constructivist Approach in Improving IPS Learning Outcomes in SD Class IV", 6 (1). <https://ojs3.unpatti.ac.id/index.php/pedagogika/article/view/1663>

- Panggabean, C. P., & Sinambela, P. N. J. . (2023). "Application of Problem Based Learning Model with Quizizz Media Assistance to Improve Mathematical Problem Solving Ability Students of JHS Private R.A Kartini Tebing Tinggi". *Journal on Education*, 5(4), 13899–13906.<https://doi.org/10.31004/joe.v5i4.2407>
- Poluan, F. F., Sumual, T. M., Wantah, E., & Wuisang, J. (2023). "Problem Identification and Needs Analysis of Canva Application-Based Economic Learning Media Development Using PBL (Problem Based Learning) Learning Model for Class IX Students of SMAN Negeri 1 Ratahan". *SEIKO : Journal of Management & Business*, 6(1), 61–66.
- Putri, N. M., & Hamimah, H. (2023). "Development of Wordwall Interactive Multimedia Using Problem Based Learning (PBL) Model in Science Learning". *Journal of Practice Learning and Educational Development*, 3(1),95–99. <https://doi.org/10.58737/jpled.v3i1.99>
- Safitri, F., & Edie, S. S. (2020). ""Application of Problem Based Learning Model Using Pair Checks Strategy to Improve Student Learning Outcomes at MAN 2 Boyolali". *Unnes Physics Education Journal*, 9(1), 97–109.
- Santoso, E., Sugiyanti, S., & Pramasdyah Sari, A. S. (2023). "Development of E-modules Based on Problem Based Learning To Improving Critical Thinking Ability of Junior High School Students on Statistics Material". *JEID: Journal of Educational Integration and Development*,3(2),103–113.<https://doi.org/10.55868/jeid.v3i2.286>
- Ulutas, B. (2023). "Using Problem-Based Learning (PBL) in an Undergraduate Ergonomics Course". *Journal of Problem Based Learning in Higher Education*,11(3),90–104.<https://doi.org/10.54337/ojs.jpblhe.v11i3.7886>
- Vistara, M. F., Asikin, M., Ardiansyah, A. S., & Pudjiastut, E. (2022). "Problem Based Learning Oriented with STEAM Context on Students' Mathematical Creative Thinking Ability". *Proceedings of the National Seminar on Mathematics (PRISMA)*, 5, 451–460.<https://journal.unnes.ac.id/sju/index.php/prisma/article/view/54564>
- Wynn, C. (2022). "Facilitating Postformal Thinking Through Problem-Based Learning in the History Survey Course: An Empirically Tested PBL Model". *Journal of Problem Based Learning in Higher Education*, 10(1), 121–133. <https://doi.org/10.54337/ojs.jpblhe.v10i1.7288>
- Yuliana, Y., & Winanto, A. (2022). "Problem Based Learning Oriented with STEAM Context on Students' Mathematical Creative Thinking Ability". *Proceedings of the National Seminar on Mathematics (PRISMA)*". *Educative: Journal of Science*, 4(6),7378–7386.<https://doi.org/10.31004/edukatif.v4i6.4092>
- Yuningsih, I., Sugiman, & Monahefi, D. N. (2024). "Systematic Literature Review: Effectiveness of Problem Based Learning Model on Problem Solving Ability Based on Students' Learning Interest in Mathematics Learning Based on Interactive Learning Media". *PRISMA, Proceedings of the National Seminar on Mathematics*, 7, 981–986.