# REVEALING THE IMPACT: META ANALYSIS OF PROBLEM BASED LEARNING MODELS ON IMPROVING COMMUNICATION SKILLS IN SCIENCE LEARNING

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**Abstract :**
The purpose of this research is to find out how well the application of the problem based learning model can improve students' communication skills in science subjects. This research uses a meta-analysis method by reviewing several articles in national journals. The data collection technique used is to search for articles that have been published in online journals via Google Scholar. The analysis technique used is miles and huberman. Based on the literature study carried out, it was concluded that the application of the problem based learning model was able to improve students' communication skills in science subjects.

Keywords: Communication, Problem Based Learning, Science

## INTRODUCTION

Natural Sciences (Science) education is not only about understanding scientific concepts, but also requires the ability to convey and communicate about this knowledge effectively. Good communication skills are an essential foundation for success in explaining ideas, presenting information, and collaborating in a scientific environment (Awaliah, 2023; Suhairi et al., 2023; Nurrachmah, 2024). Amid the need for strong communication skills, various learning models have been adopted to improve these abilities, and among them, Problem-Based Learning (PBL) has become an interesting research subject.

Problem-Based Learning is a learning approach that allows students to hone their communication skills through solving real problems related to natural science (Kassymova at al., 2020; Fahmi et al., 2021; Sebatana, 2022). This model encourages students to work cooperatively in groups, in-depth analysis, and presentation of results, all of which play a role in developing students' communication skills (Hotimah, 2020; Ariyanti, 2023). This model offers an active approach that encourages students to solve problems, work in groups, and develop their communication skills through discussions, presentations, and solving problems that are relevant to real life (Firdaus et al., 2021).

A number of studies have been conducted to evaluate the effect of the PBL model on students' communication skills in science learning. However, to fully understand the extent to which this model is effective in improving communication skills, a meta-analysis is needed. Meta-analysis provides a

broader and stronger picture through a synthesis of various studies that have been carried out, making it possible to gain a deeper understanding of the impact of the PBL model on students' communication skills in the context of science learning.

Through this meta-analysis, we aim to collect data from various relevant studies, analyze existing findings, and prepare a comprehensive and detailed synthesis. This step will provide an opportunity to see general patterns, identify variables that influence outcomes, and explore potential differences in the effectiveness of PBL models depending on the context and method of implementation.

This research is in line with research conducted by Juandi & Tamur (2021) who conducted meta-analysis research on the impact of using problem based learning models. The difference between the research conducted by Juandi & Tamur (2021) and the research conducted by current researchers is the variables.

The urgency of this research is that communication in science subjects not only facilitates deep understanding, but also strengthens students' critical thinking skills. By revealing the influence of the problem-based learning model, this research can provide valuable guidance for curriculum development that focuses on improving students' communication skills in science subjects.

It is hoped that this meta-analysis will provide an important contribution in expanding understanding of the influence of the PBL model on students' communication skills in science learning. In addition, the results of this analysis are expected to provide useful guidance for the development of more effective learning strategies in the future. Based on the explanation above, the aim of this research is to find out how well the application of the problem based learning model can improve students' communication skills in science subjects.

## RESEARCH METHOD

This research uses a meta-analysis method by reviewing several articles in national journals. This meta-analysis research uses a sample of 10 articles in national journals regarding the influence of the problem based learning model on students' communication skills in science subjects. The meta analysis process is carried out as follows: First, explain and determine the problem to be researched regarding the influence of the problem based learning model on students' communication skills in science subjects. Second, look for data according to the theme that will be used, namely previous articles that have been published in online journals in the 2019-2023 period. Third, understand the articles that have been collected to look for similarities between the articles and the problem that the researcher will use. Fifth, re-analyze the articles that have been collected to draw conclusions.

The data collection technique used is to search for articles that have been published in online journals via Google Scholar. The analysis technique used is miles and huberman. Miles and Huberman's data analysis technique includes three stages, namely data reduction, data presentation and drawing conclusions (Huda & Rokhman, 2021; Latifah & Supena, 202; Putri & Fadly, 2022).

## RESULTS AND DISCUSSION

The results of data collection in the form of a literature study of 10 national articles regarding the influence of the problem based learning model on students' communication skills in science subjects can be seen in the table below:

Table 1. Articles about the influence of the problem based learning model on students' communication skills in science subjects

| No. | Author | Publication Year | Article Title | Research result |
|---|---|---|---|---|
| 1. | Iftitahurrahimah, Yayuk Andayani dan Syarifah Wahidah Al Idrus | 2020 | The Influence of the Problem Based Learning (Pbl) Model on Students' Communication Ability Main Material Electrolyte and Non-Electrolyte Solutions | Based on hypothesis testing using the t-test at a significance level of 5%, it shows that the Problem Based Learning model has an influence on students' written communication skills on the subject matter of electrolyte and non-electrolyte |

| No. | Author | Publication Year | Article Title | Research result |
|---|---|---|---|---|
| 2. | Atika Erlina Nasution, Irvan, Ismail hanif batubara | 2020 | Application of Problem Based Learning and Ethnomathematics Models Assisted by Geogebra to Improve Mathematical Communication Skills | solutions. Hypothesis testing using the t-test also showed that the Problem Based Learning model had an influence on students' oral communication skills on the subject of electrolyte and non-electrolyte solutions. The results of this study indicate that the linear regression line equation is constant for class students' mathematical communication abilities experiment I, namely 35.72, is greater than the constant of the linear regression line equation for experimental class II, namely 28.48. In other words, it can be concluded that the mathematical communication skills of students who receive problem based learning with ethnomathematics using Geogebra are significantly better than students who receive problem based learning with ethnomathematics without using Geogebra. |
| 3. | Putri Madhavia, Atma Murni, dan Sehatta Saragih | 2020 | The Influence of the Problem Based Learning Model on the Mathematical Communication Abilities of Class VII Middle School Students in Kuantan Singingi Regency | The research results show that there is an influence of implementing PBL on mathematical communication skills in terms of all students. The effect of implementing PBL on mathematical communication skills in terms of school level shows that at high school level students are better than students who use conventional learning, while at medium and low school levels there is no significant effect. |
| 4. | Rohmatul Layliyyah, Endah Tri Wisudaningsih dan Eka Rahayu | 2022 | The Influence of the Problem Based Learning Model on the Mathematical Communication Abilities of Class VII Students | The research results show the Sig value. (2-tailed)$0.00 \leq a=0.05$, so there is a significant effect on average on the mathematical communication skills of students in the experimental class compared to the control class. Mathematical |

| No. | Author | Publication Year | Article Title | Research result |
|---|---|---|---|---|
| | | | | communication skills in the experimental class which uses the Problem Based Learning learning model are higher than those in the control class which uses the conventional learning model. |
| 5. | Eti Widiyanti dan Indiyah Yuni Astuti | 2023 | Application of the Practicum-Based Pbl Model to Improve Learning Outcomes and Scientific Communication Abilities | The results of the research prove that implementing learning using a practicum-based PBL model can improve students' learning outcomes and scientific communication skills. This can be seen from an increase in learning outcomes from 12.5% to 87.5% and an increase in students' scientific communication skills from poor and sufficient criteria to very good criteria. These data provide the conclusion that learning using a practicum-based PBL model can improve learning outcomes and scientific communication skills of mixed material students in class VIII H Semester 2 of SMP Negeri 1 Tegal. |
| 6. | Widayanti, Siti Anisatur Rofiqah dan Trio Julianton | 2021 | Problem Based Learning: Influence on Conceptual Understanding and Communication of Middle School Students | Based on the results of the t-test statistical calculations, it was found that tcount > ttable (12.61 > 1.67), then Ha was accepted. This shows that there is a significant influence of the problem based learning (PBL) learning model on the ability to understand concepts in junior high school students. Meanwhile, from the questionnaire calculation results, the experimental class had a higher score than the control class. So it can be concluded that student communication in the experimental class has a significant increase compared to the control class. The findings of this research are that PBL can improve junior high school students' understanding of concepts and |

| No. | Author | Publication Year | Article Title | Research result |
|---|---|---|---|---|
| 7. | Nadira Rasya Pertiwi, Hilda Novia Sabila, dan Anita Sintawati | 2023 | Implementation of the Problem-Based Learning Model on Collaborative Skills and Science Communication on Excretory System Material at Smpn 1 Ciamis | communication. Students who have a high understanding of concepts have better communication tendencies. Based on the results of data analysis covering collaborative aspects and science communication, it shows that in cycle I the percentage obtained was 67%, which means that the level of student collaboration was included in the collaborative category and in cycle II the percentage was obtained at 83%, which means the level of collaboration of students was included in very collaborative category. Meanwhile, for science communication skills, a percentage of 65% was obtained, which is classified as good. These percentage results show that the problem based learning model is able to improve collaborative skills and science communication abilities. |
| 8. | Adelina natalia Lubis dan Izwita Dewi | 2022 | Application of Problem-Based Learning Assisted by Edmodo to Improve the Mathematical Communication Skills of Class XI Students at SMA Negeri 11 Medan T.A. 2022/2023 | Research results: (1) actions taken to improve students' mathematical communication skills, namely applying the PBL model combined with group discussion assignments on Edmodo, which were developed by improving mathematical communication steps on LKPD, rearranging students' sitting positions, ensuring students share tasks in work on LKPD, facilitate additional reading material, discuss student difficulties in front of the class, increase question and answer sessions, give direct awards to students who submit opinions/respond to questions, and motivate students to use Edmodo's discussion facilities; (2) the average N-gain value is 0.62 so that the increase in students' |

| No. | Author | Publication Year | Article Title | Research result |
|-----|--------|------------------|---------------|-----------------|
| | | | | mathematical communication skills is classified as moderate. |
| 9. | Marosa Robi'atul Adawiyah | 2022 | The Influence of the Problem Based Learning Model Assisted by Google Workspace on Student Communication Skills in Biology Learning During the Pandemic | Based on the research results, it is known that the results of hypothesis testing using the ANACOVA test show that there is a significant difference in communication skills between students taught using the Google Workspace-based Problem Based Learning (PBL) learning model compared to the regular learning model. |
| 10. | Hana Hanipah dan Tina Sri Sumartini | 2021 | Comparison of Students' Mathematical Communication Skills between Problem Based Learning and Direct Instruction | Based on the results of statistical analysis, it was concluded that the mathematical communication skills of students who received the PBL learning model were better than students who received the DI learning model with interpretation. The increase in mathematical communication skills of students from both classes with moderate interpretation as well as students' attitudes towards learning through the PBL and DI learning models with interpretation enough |

Based on the results of a literature study regarding the influence of the problem based learning model on students' communication skills in science subjects, it can be concluded that in journal number one, the problem based learning model can improve students' written communication and oral communication. Meanwhile, for journals number two, three, four, eight and ten, the results showed that the problem based learning model could improve students' mathematical communication skills. In journals number six and nine, the results showed that the problem based learning model could improve students' communication skills. Meanwhile, in journal number seven, the problem based learning model can improve students' science communication. So it can be concluded that students' communication skills can be improved by implementing the problem based learning model.

**CONCLUSION**

Based on the results of the literature study that has been carried out, it can be concluded that the problem based learning model can improve students' communication skills in science learning. The communication skills that can be improved with the problem based learning model are mathematical communication, science communication, oral communication and written communication.

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