**Journal of Mathematics Science and Education**
e-ISSN: 2623-2383. 15 Desember 2025, Vol. 8, No. 2, 47 - 62
https://ojs.unpari.ac.id/JOMSE/issue/view/20

# *SYSTEMATIC LITERATURE REVIEW: STUDENT WORKSHEETS USING PROBLEM BASED LEARNING FOR ARITHMETIC SEQUENCES AND SERIES MATERIAL*

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**Abstrak**

Tujuan dari *literature review* ini adalah untuk mengkaji dan merangkum beberapa artikel yang membahas tentang pengembangan dan penerapan Lembar Kerja Peserta Didik (LKPD) dengan model pembelajaran *Problem Based Learning* (PBL) pada materi Barisan dan Deret Aritmatika. Metode yang digunakan dalam kajian ini adalah *Systematic Literature Review* (SLR) yang terdiri dari 6 tahapan yaitu: *Research Question, Selection Criteria, Search Strategy, Select Studies, The Quality of Studies,* dan *Synthesis Result*. Kajian ini menggunakan analisis PICOC *(Population, Intervention, Comparison, Outcome, and Context)*. Artikel yang di-*review* berjumlah 12 artikel yang relevan dan diterbitkan dari tahun 2020 sampai tahun 2025. Hasil kajian ini menunjukkan bahwa pengembangan dan penerapan LKPD memberikan dampak positif terhadap peningkatkan hasil belajar siswa. Selain itu, hasil kajian ini juga menunjukkan bahwa LKPD dengan menggunakan model *Problem Based Learning* dapat mengasah kemampuan pemecahan masalah, kemampuan pemahaman matematis, penalaran matematis dan komunikasi matematis siswa, khususnya pada materi Barisan dan Deret Aritmatika.

**Kata Kunci:** SLR, LKPD, PBL, Sequence and Series

***Abstract***

*The purpose of this literature review is to examine and summarize several articles that discuss the development and implementation of Student Worksheets (LKPD) with the Problem Based Learning (PBL) learning model on the Arithmetic Sequences and Series material. The method used in this study is the Systematic Literature Review (SLR) which consists of 6 stages, namely: Research Question, Selection Criteria, Search Strategy, Select Studies, The Quality of Studies, and*

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*Synthesis Result. This study uses PICOC analysis (Population, Intervention, Comparison, Outcome, and Context). The articles reviewed amounted to 12 relevant articles and were published from 2020 to 2025. The results of this study indicate that the development and implementation of LKPD have a positive impact on improving student learning outcomes. In addition, the results of this study also show that LKPD using the Problem Based Learning model can hone students' problem-solving skills, mathematical understanding skills, mathematical reasoning and mathematical communication, especially on the Arithmetic Sequences and Series material.*

**Keyword:** *SLR, LKPD, PBL, Sequence and Series*

## Introduction

Mathematics must be studied during school because it plays an important role in developing logical, analytical thinking skills and problem-solving skills needed in everyday life (Safitri & Hadi, 2024). However, in reality, there are still many students who have difficulty learning mathematics (Herdiansyah et al., 2023). This is because students are directed to memorize formulas as solutions to solve math problems, as a result, students' mathematics learning outcomes are relatively lower than other subjects, as reflected in the National Examination scores (Kristanti et al., 2024). Especially in the material on arithmetic sequences and series because it requires students to understand the number patterns in the questions.

Student Worksheets are teaching materials in the form of printed paper that contain a summary of the material and instructions for carrying out tasks, and are designed based on the basic competencies to be achieved (Maharani et al., 2023). Ristanti & Hadi (2024) stated that student worksheets have an important role in encouraging student activity and helping to achieve the expected learning outcomes. However, in reality, according to Tambunan et al (2022), many teachers only buy student worksheets from printing agents, without adjusting them to the characteristics of the students. Therefore, the development of LKPD needs to be carried out so that it can be a supporting tool in facilitating the learning process (Herlina & Ihsan, 2020).

The Problem Based Learning learning model is an approach that uses real-world problems as the starting point for the learning process (Dayanti et al., 2024). Furthermore, according to Puspitasari et al (2022), the PBL model is a learning model that supports teachers in improving thinking skills and problem-solving skills. So it is hoped that this model can create a more enjoyable and meaningful learning atmosphere for students (Nugroho et al., 2021).

According to Wardani et al (2024), sequence and series material has several solution methods, so it requires good problem-solving skills. As a result, not a few students have difficulty in understanding the material on arithmetic sequences and series. Based on the results of (Hartati, 2021) research, students

experience several difficulties, namely: 1) Students who do not understand the basic concepts of arithmetic sequences and series; 2) Students have difficulty calculating exponential multiplication; 3) Students are not yet able to distinguish between arithmetic sequences and series.

Based on the explanation above, the author decided to conduct a systematic review of various relevant literature in order to gain an in-depth understanding of the Student Worksheet using the Problem Based Learning model to improve student learning outcomes, especially on the material of arithmetic sequences and series. Therefore, the author compiled a study entitled "Systematic Literature Review: Student Worksheets Using Problem Based Learning for Arithmetic Sequences and Series Material".

## Method.

The method used is the Systematic Literature Review (SLR) method. SLR is a method used to collect various relevant studies and analyze the findings to deepen understanding of certain research (Sutomo & Turmudi, 2025). Dayanti et al (2024) emphasized that the purpose of SLR is to obtain answers to similar questions in various studies with similar topics.

In a systematic literature review, eligibility criteria are used as a reference in selecting articles to be analyzed. The framework used in this study is the PICOC (Population, Intervention, Comparison, Outcome and Context) framework. The SLR research procedure according to (Zawacki-Richter et al., 2019) is presented in Figure 1 below:


**Figure 1.** SLR Research Procedure

The first stage is Research Question, which is a question formulated based on the main problem so that the research is directed. The Research Question of this study is "Can student worksheets using the Problem Based Learning model improve students' learning outcomes on the material of arithmetic sequences and series?".

The second stage is the Selection Criteria stage, which consists of inclusion criteria (suitable articles) and exclusion criteria (articles that are not related to the topic). The following inclusion criteria and exclusion criteria will be presented in table 1.

**Table 1.** Inclusion and Exclusion Criteria

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| Inclusion Criteria | 1. Journal about Student Worksheets on Arithmetic Sequences and Series<br>2. Problem Based Learning Model on Arithmetic Sequences and Series<br>3. Publication (2020-2025)<br>4. Fulltext |
| Exclusion Criteria | 1. Journals outside the research topic<br>2. Publication before 2020<br>3. Unfulltext |

The third stage is Search Strategy, at this stage it is important to pay attention to reliable sources of information and relevant keywords. The sources of information used are Publish or Perish, SINTA, and Google Scholar with the keywords "Student Worksheets/E-Student Worksheets, Problem Based Learning (PBL), and Arithmetic Sequences and Series".

Next is the Select Studies stage. At the beginning of the search, 23 articles were searched, then checks were carried out to ensure that the articles obtained were relevant to the research objectives that had been determined. After the assessment was carried out, 12 articles were found that were relevant to the problem area or were inclusion criteria.

The fifth stage is The Quality of Studies. At this stage, an in-depth evaluation is carried out regarding the quality of each article that has been selected in order to ascertain whether the article has been used to make a big impact on scientific standards research objectives.

The final stage is Synthesis Result. In this final stage, the relevant articles that have been evaluated will be arranged in the form of tables containing important information.

Based on the Selection Criteria stage, there are inclusion and exclusion criteria completed with PICOC analysis. Below we will present table 2. PICOC analysis.

**Table 2.** PICOC Analysis

| No | PICOC Analysis | Inclusion Criteria | Exclusion Criteria |
|---|---|---|---|
| 1 | Population | Secondary School Students (SMP, SMA/MA/SMK) both in public and private schools. | There were no exclusion criteria |
| 2 | Intervention | Use of Student Worksheets/E-Student Worksheets Problem Based Learning (PBL) model | Using comic media (1 of 11 articles) |

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| 3 | Comparison | Using R&D, PTK, quantitative, and experimental types of research | Using SLR type, qualitative, design-based research (6 of 11 articles) |
| 4 | Outcome | Focus on cognitive learning outcomes (problem solving, mathematical understanding and reasoning) | There were no exclusion criteria |
| 5 | Context | Arithmetic sequences and series material | Circle material, mathematical logic, number patterns (3 of 11 articles) |

**Result and Discussion.**

The results of the research data were obtained from 23 articles, which were then selected to obtain 12 articles that became the inclusion criteria. Furthermore, table 3 contains articles based on Sinta.

**Table 3.** Types of Publications Based on SINTA

| Types of Publications | Lots of Article |
|---|---|
| Sinta 2 | 1 |
| Sinta 3 | 7 |
| Sinta 4 | 8 |
| Sinta 5 | 4 |
| Unaccredited Journal Sinta | 3 |

At the Synthesis Result stage, the relevant articles that have been evaluated will be arranged in the form of tables. This table contains important information regarding the article title, author, publication, year of publication, research results and review results.

**Table 4.** Summary of Research Results from Year 2020-2025

| No | TITLE, AUTHOR, PUBLICATION, YEAR | HASIL PENELITIAN | HASIL *REVIEW* |
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|---|---|---|---|
| **1** | Pengembangan LKPD Berbasis *Problem Based Learning* untuk Meningkatkan Kemampuan Pemecahan Masalah pada Materi Barisan dan Deret (Development of LKPD Based on Problem Based Learning to Improve Problem Solving Skills on Sequence and Series Material)<br>Author: Lailatul Cahya Wardani, Sulis Janu Hartati, and Lusiana Prastiwi<br>Publication: JPM: Jurnal Pendidikan MIPA, Sinta 4<br>Year : (2024) | The type of research used is Research and Development using 4-D mode. The subjects of this research are students of class X TKJ 1 SMK PGRI 13 Surabaya consisting of 31 people. The results of the Student Worksheets feasibility test are material expert validation of 93.85% and media expert validation of 96.67% (very feasible). The material experts in this research are two lecturers from mathematics experts who are competent in the field of materials, while the media experts consist of two lecturers and mathematics experts in the fields of materials and teaching materials. | Based on the results of the review, it can be concluded that the Student Worksheets developed is very suitable for use in learning. Validation of this research shows a very valid level, so it can be said that this Student Worksheets is in accordance with the standards of effective learning content. Apart from that, this Student Worksheets can also increase the ability to solve problems and improve students' learning outcomes, due to an increase in the pre-test score from 42.8 to 77.8 in the post-test assessment. |
| 2 | Pengembangan LKPD Berbasis *Problem Based Learning* Pada Barisan dan Deret Aritmatika Kelas XI (Development of LKPD Based on Problem Based Learning on Arithmetic Sequences and Series for Grade XI)<br>Author: Ririn Ristanti and Muhamad Sofian | The development mode used in this research is the ADDIE model. The results of the research show that the Student Worksheets instrument developed is considered valid, the validity of all question items is 0.5 or more. The expert validation for this research is two experts in mathematics assessment and two mathematics teachers. The results of the research show that this Student Worksheets is rated as reliable, with a | From the results of the review, it can be concluded that the PBL Student Worksheets for class XI is declared valid and reliable. This is reviewed based on the validity aspect of the Student Worksheets institution, with the average score of the 10 students who did the Student Worksheets being 95 (very good) in small class research. Therefore, the Student Worksheets developed is stated to be effective |

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| | Hadi Publication: Pedagogy: Jurnal Pendidikan Matematika, Sinta 4 Year : (2022) | reliability of 0.85 with an easy or moderate level of difficulty. | in helping students better understand the material of arithmetic sequences and series. |
| 3 | Pengembangan E-LKPD Berbasis *Problem Based Learning* Pada Materi Barisan dan Deret Kelas X SMAN 1 Bungo Kabupaten Bungo 3. (Development of E-LKPD Based on Problem Based Learning on Sequence and Series Material for Class X SMAN 1 Bungo, Bungo Regency) Author: Tanzila Dwi Zulpani, Anna Cesaria, and Dewi Yuliana Fitri Publication: Jurnal Equation, Sinta 4 Year : (2024) | This research uses the type of Research and Development. The mode used is the Plomp mode which consists of preliminary research, prototyping phase and assembly phase. This e-Student Worksheets has a validity value of 86%, and a practicality value of 92.1%. The results of the validation sheet are given to material experts, namely mathematics education and media experts, namely information technology. | The development of teaching materials follows the Plomp mode, that is, at the initial stage, identification of problems and needs in implementing the lesson is carried out. Then, in stage two, the design and development of the PBL-based E-Student Worksheets portotype are carried out on sequence and series material. From the results of the review, the E-Student Worksheets based on Problem Based Learning for the material of arithmetic sequences and series was declared valid and practical. |
| 4 | Pengembangan Lembar Kerja Peserta Didik Menggunakan Model Pembelajaran *Problem Based Learning* pada Materi Barisan dan Deret Aritmatika di Kelas XI SMA Gajah Mada Medan | This research uses research and development models. Instruments used: validation sheet, practicality and effectiveness sheet. The research results showed that the Student Worksheets received a value of as much as 92.2% from subject matter experts and a value of as much as 93.8% from | Based on the results of the review, it was found that the Student Worksheets used the Problem Based Learning model that was developed and it was stated that the Student Worksheets was very suitable for use in learning. This is because the Student Worksheets developed is very valid |

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| | (Development of Student Worksheets Using the Problem Based Learning Model on Arithmetic Sequences and Series Material in Class XI of SMA Gajah Mada Medan) Author: Lasma Warni Tambunan, Pesta R Manalu, Suci Ramadhani, and Firman Pangaribuan Publication: Journal of Mathematics Education and Applied, Sinta 4 Year : (2022) | media experts. The material experts in this research are mathematics teachers at high school, while the media experts are two lecturers in mathematics education at HKBP Nommensen University. The assessment of students' response to practicality was 86.5% and the response to effectiveness was 85%. | for material experts and media experts. Apart from that, based on student response scores, it is evident that Student Worksheets is very practical and very effective in use. |
| 5 | Analisis E-LKPD Berbantuan *Liveworksheets* Berbasis PBL Materi Barisan dan Deret untuk Memfasilitasi Kemampuan Pemahaman Matematis (Analysis of E-LKPD Assisted by PBL-Based Liveworksheets on Sequences and Series Material to Facilitate Mathematical Understanding Skills) Author: Dhea Ika Putri, | This research is an R&D (Research & Development) research using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model. It obtained a validation score of 99.13% (very decent). Based on the results of the students' response to the practicality of E-Student Worksheets in the group obtained a score of 85.08%, and the practicality of E-Student Worksheets in the group obtained a score of 82.79%. | From the results of the journal review, it can be concluded that E-Student Worksheets with the help of Liveworksheets Based on PBL Line and Series Material is valid and practical, as well as can facilitate students' mathematical understanding ability. The advantage of E-Student Worksheets is that it can facilitate learners to carry out learning activities because it is easy to carry everywhere and can be accessed through each learner's mobile phone. The disadvantage |

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| | Sehatta Saragih, and Syarifah Nur Siregar. Publication: Juring (Journal for Research Mathematics Learning), Sinta 4 Year : (2023) | | is that not all students have mobile phones. |
| 6 | Pengaruh Model *Problem Based Learning* Terhadap Kemampuan Matematis Peserta Didik Materi Barisan dan Deret (The Influence of Problem Based Learning Model on Students' Mathematical Ability in Sequence and Series Material) Author: Agustina, Desty Septianawati, and Yumi Sarassanti Publication: Al-'Adad: Jurnal Tadris Matematika Year : (2024) | In this research, a quantitative approach was used with a pretest-posttest control group design. The population is 52 people consisting of an experimental class and a control class. The Problem Based Learning model was applied to the experimental class and the conventional model was applied to the control class. The results of the research showed that the average of the experimental class increased from 40.03 to 83.90. | The type of research is a simple pretest-posttest control group design to determine whether there is an influence of the PBL learning model on the mathematical ability of the students in the message. Based on the results of the review, it can be concluded that the application of the PBL model has a positive impact on the mathematical ability of students, namely experiencing an increase in the average score. |
| 7 | Model Pembelajaran Berbasis Masalah dan Kemampuan Penalaran Matematika Siswa pada Materi Barisan dan Deret Aritmatika (Problem-Based Learning Model and Students' Mathematical Reasoning Ability | The method used in this research is an experimental research with a post-test only control design. Until it is taken by randomly selecting the class. The results of the research stated that after applying the PBL model, students in the experimental class were more accustomed to performing mathematical reasoning in line and | The results of the research showed that students in the classroom were more accustomed to translating the story and converting it into formulas. Meanwhile, students in the control class experienced difficulty in placing the formula if given a new problem. Based on the review that has been |

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| | in Arithmetic Series and Sequences Material)<br>Author:<br>Novia Widiawati, Syaifuddin, and Nyimas Inda Kusumawati<br>Publication:<br>INDIKTIKA (Jurnal Inovasi Pendidikan Matematika), Sinta 3<br>Year : (2020) | series story problems. Meanwhile, students in the control class only stuck to the formula that they understood. | conducted, it is concluded that there is an influence of the Problem Based Learning model on students' mathematical reasoning ability. |
| **8** | Peningkatan Prestasi Belajar Siswa Materi Barisan dan Deret Melalui Penerapan Pembelajaran *Problem Based Learning* (PBL) di Kelas X MIPA 2 SMA Negeri 1 Bangsal (Improving Student Learning Achievement in Sequence and Series Material Through the Implementation of Problem Based Learning (PBL) in Class X MIPA 2 SMA Negeri 1 Bangsal)<br>Author:<br>Seger Sarjono<br>Publication:<br>Wewarah: Jurnal Pendidikan Multidisipliner<br>Year : (2022) | This type of research is action research. This research went through 2 cycles, namely in the action of cycle 1, focused on the material of sequence and series. In cycle 2, an important activity is that students work in groups and each member of the group is given homework. The subject of this research is 36 students of class X MIPA 2 SMA Negeri 1 Bangsal. The results of the research show that the application of Problem Based Learning can improve the activity and learning outcomes of students. | From the results of the review, it can be concluded that the learning performance of students in class X MIPA 2 SMA Negeri 1 Bangsal improved by implementing the Problem Based Learning model. This is based on the pre-cycle obtained the average score of students is 50, during the implementation in cycle I, it was observed that the average score of students became 82.22 and the implementation in cycle II showed that the average score of students increased to 86.38. |

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| **9** | Penerapan Model *Problem Based Learning* Berbantuan LKPD Berbasis Kontekstual untuk Meningkatkan Hasil Belajar Peserta Didik (Implementation of Problem Based Learning Model Assisted by Contextual Based LKPD to Improve Student Learning Outcomes)<br>Author: Muhammad Hasanul Muna, Rasiman, Lukman Harun and Masruhan Mufid<br>Publication: JPSS: Jurnal Pendidikan Sang Surya, Sinta 5<br>Year : (2024) | In this research, the Problem Based Learning model with the help of context-based Student Worksheets is used to improve student learning outcomes. This research is a welding action conducted at SMK Negeri 07 Semarang. This study found that there was a significant improvement in student achievement. Initially, the number of learners who achieved minimum completion was 22.2% and increased to 86.1% after the implementation of the Student Worksheets assisted PBL model. | This type of classroom action research aims to develop strategies so that learning becomes more effective and efficient. In the pre-cycle it was found that 22.2% of students had completed the Minimum Achievement Criteria, this then increased to 80.6% in cycle I, and implementation in cycle II showed an increase to 86.1% of students who had completed KKM. This means that the application of the Problem Based Learning model with the help of Student Worksheets can improve student learning outcomes. |
| 10 | Pengembangan Perangkat Pembelajaran Berbasis Masalah untuk Memfasilitasi Kemampuan Pemecahan Masalah Matematis Pada Materi Barisan dan Deret Kelas XI SMA (Development of Problem-Based Learning Tools to Facilitate Mathematical | This research is the aim of producing teaching learning tools in the form of syllabus, lesson plans and student worksheet for class XI high school class and class material. Based on validation from experts, the average assessment value for the syllabus is 89.38%, the RPP is 90.46% and the student worksheet is 89.72% (very valid). The learning tools were categorized as very practical in trials with small groups with an | Based on the results of the review, it can be concluded that the syllabus, RPP and student worksheet can be tested because the learning tools developed have met the very valid criteria. Apart from that, the learning tools developed have met practical criteria because they are easy to use by teachers and students and their level of implementation is in the good category. This is based on |

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| | Problem Solving Skills in Sequence and Series Material for Grade XI High School)<br>Author: Badrulaini, Zulkarnain, and Kartini<br>Publication: Juring (Journal for Research Mathematics Learning), Sinta 4<br>Year : (2020) | average student response of 85.71%. In the large group trial of the teacher activity observation sheet 93.06% were categorized as very good. | implementation observation sheets and student response questionnaires. |
| 11 | Pengembangan Perangkat Pembelajaran Matematika Menggunakan Model *Problem Based Learning* Pada Materi Barisan dan Deret Untuk Kelas XI SMA/MA (Development of Mathematics Learning Tools Using Problem Based Learning Model on Sequence and Series Material for Grade XI SMA/MA)<br>Author: Ravina Faradilla Syahril, Sehatta Saragih, and Susda Heleni<br>Publication: Jurnal Prinsip Pedidikan Matematika, Sinta 5 | This research aims to develop learning tools that are suitable for the 2013 curriculum in order to help teachers in carrying out learning processes. This learning tool contains syllabus, RPP and student worksheets. This research uses a 4-D model. The results of the validation data analysis showed that the average syllabus was 3.76, the RPP had a score of 3.78 and the LKPD had a score of 3.75 so it was concluded that all three criteria were very valid. | Based on the results of the review, it can be concluded that the learning devices in the form of Syllabus, RPP and student worksheets that were developed have met the very valid criteria. This is based on the validation results that show a very valid score, which means that the learning devices are very feasible and can be tested in the learning process. |

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| | Year : (2021) | | |
| 12 | Development of Learning Tools by Application of Problem Based Learning Models to Improve Mathematical Communication Capabilities of Sequence and Series Materials<br>Author:<br>Nur Atika, Yenita Roza, and Atma Murni<br>Publication:<br>Journal of Educational Sciences, Sinta 4<br>Year : (Atika et al., 2020) | This research aims to produce learning tools that can improve Mathematical Communication Skills by applying the PBL mode. The results of the validation of Syllabus, RPP, LKPD and KKM are 91.67%, 91.30%, 89.09% and 87.15% for very valid criteria. Validation was carried out by two lectures of mathematics education and a mathematics teacher in class XI at SMA N 5 Pekanbaru. The results of the practicalization show that the criteria are very practical with a percentage of trials in small groups of 95.57%, trials in large groups of 96.07% and response rates of 96.25%. | Based on the results of the review, it can be concluded that research into the development of learning tools using the problem base learning mode is worthy of use in the learning process and can improve students' mathematical communication skills in sequence and class materials. This learning tool has been validated by qualified experts, as well as class XI students to ensure the practicality and effectiveness of this learning tool. Following validation, grade XI students stated that this learning tool was very valid, practical and effective. |

Based on the results of a review of 12 relevant articles, studies conducted by (Wardani et al., 2024), (Ristanti & Hadi, 2022), (Dwi Zulpani et al., 2024), (Tambunan et al., 2022), (Putri et al., 2023), (Syahril et al., 2021), (Badrulaini et al., 2020), and (Atika et al., 2020) show that the developed LKPD has tested its feasibility based on material validation and media validation. This validation is carried out by experts, such as lecturers and mathematics teachers, or information technology lecturers who are experts in the field of materials and teaching materials. In this way, the use of PBL mode LKPD helps teachers in teaching and helping students to better understand sequence and series material.

Studies conducted by (Wardani et al., 2024), (Sarjono, 2022), and (Muna et al., 2024) show that LKPD with the Problem Based Learning model can improve student learning outcomes. In addition, (Wardani et al., 2024) and (Badrulaini et al., 2020) state that LKPD using the PBL model can improve problem-solving abilities. Other studies conducted by (Putri et al., 2023), (Tina et al., 2024), (Widiati et al., 2020), and (Atika et al., 2020) show that LKPD with the

PBL model can improve students' mathematical abilities including mathematical understanding, mathematical reasoning, and mathematical communication.

## Conclusion (S) and Recommendation (S)

This study is based on the fact that there are still many students who experience difficulties in studying mathematics on the subject of arithmetic sequences and series, due to the lack of connection with the real world. Apart from that, the use of LKPD must also be tailored to the student's characteristics. Based on the results and discussion of the 12 articles described above, it can be concluded that LKPD with PBL mode can improve students' learning outcomes, increase students' ability to solve problems, understand, reason and communicate especially in mathematics. arithmetic sequence and series material.

Based on the results of the study that has been conducted, the development of Student Worksheets based on the Problem Based Learning model on the material of arithmetic sequences and series needs to be continued. This is because the material of arithmetic sequences and series has a strong relationship with real-world problems. Therefore, it is recommended to conduct further research on Student Worksheets based on the Problem Based Learning model. For example, the development of Electronic Student Worksheets and also extending the period of use of the Student Worksheets, do not only use them for one semester.

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