Journal of English Language and Education
ISSN 2597- 6850 (Online), 2502-4132 (Print)
Journal Homepage: https://jele.or.id/index.php/jele/index
OPEN ACCESS Article

Needs Analysis for PBL-Based Mathematics Student Worksheet at SMPN L Sidoharjo

https://doi.org/10.31004/jele.v10i2.808

*Rita Eryani, Viktor Pandra, Sulistiyono[1,2,3]
[123]PGRI Silampari University, Lubuk Linggau, Indonesia.
Corresponding Author: eryanirita69@gmail.com

ABSTRACT

This study aims to analyze the needs for developing mathematics student worksheets (Student Worksheet) based on the Problem-Based Learning (PBL) approach at SMPN L Sidoharjo. The research was motivated by the growing awareness among educators of the importance of innovative learning tools that foster critical thinking, collaboration, and active student involvement. Using a qualitative descriptive method, data were collected through interviews, questionnaires, and classroom observations involving mathematics teachers and students. The results show a strong readiness and enthusiasm from both teachers and students toward the implementation of PBL-based learning. While the existing Student Worksheets still require improvement, there is already a foundation of supportive teaching practices and student openness to problem-based learning activities. The study concludes that the school environment is highly conducive to the integration of PBL in mathematics instruction. These findings support the development of Student Worksheets that are not only aligned with curriculum goals but also responsive to the needs and potentials of students at SMPN L Sidoharjo.

Keywords: *Needs Analysis, Mathematics Student Worksheet, Problem-Based Learning, Student Engagement, Innovative Learning*

Article History:
Received 16th March 2025
Accepted 07th April 2025
Published 14th April 2025

INTRODUCTION

Mathematics is essential in both education and everyday life, serving not only as a foundation for academic success but also as a vital tool for developing critical thinking and problem-solving skills. (I. N. Sari & Sulisworo, 2023) at SMPN L Sidoharjo, the needs analysis for a Problem-Based Learning (PBL) based mathematics Student Worksheet highlights the importance of students engaging in meaningful, real-world learning experiences. By integrating mathematics with daily life situations, students are encouraged to think analytically, work collaboratively, and apply their knowledge in practical ways. (Mariani & Dewi, 2025)Mathematics learning in the era of the *Merdeka Curriculum* emphasizes not only conceptual understanding but also critical thinking, problem-solving, and collaboration skills. One of the learning approaches that supports the development of these competencies is *Problem-Based Learning* (PBL). PBL centers on real-world problems as the starting point for learning, encouraging active student engagement and independent thinking (Triyani et al., 2024).

The integration of innovative learning methods, such as Problem-Based Learning (PBL), is still limited due to a lack of training, resources, and appropriate learning tools. Students also struggle with problem-solving skills, indicating a need for learning models that can foster analytical thinking. Lastly, time constraints and limited school facilities hinder the

implementation of more interactive and student-centered learning approaches. These challenges highlight the urgent need for the development of a PBL-based mathematics Student Worksheet that aligns with students' needs and the school's learning environment. (Putri, 2025)The main purpose of the Student Worksheet is to assist teachers in implementing effective learning activities. In addition, it is expected to help students learn independently, understand concepts, and carry out written tasks. The Student Worksheet is an essential part of the learning tools that serves as a medium to provide students with opportunities to be active and creative throughout the learning process (Kusmayanti & Murtiyasa, 2024).

However, the successful implementation of PBL requires appropriate learning tools, including *Student Worksheets (*Student Worksheet). PBL-based Student Worksheet must be designed to meet the specific needs of students and the learning context of the school. Preliminary observations at SMPN L Sidoharjo indicate that the existing Student Worksheets are still conventional and do not fully support a problem-based learning process. This limitation affects the development of students' critical thinking and problem-solving abilities. Therefore, a needs analysis is essential as an initial step toward developing PBL-based mathematics Student Worksheet that aligns with the characteristics and learning needs of students at SMPN L Sidoharjo.(Kusmayanti & Murtiyasa, 2024).

This study aims to identify the needs of both teachers and students regarding the development of PBL-based Student Worksheet and to analyze the school's readiness to support the implementation of this approach. The primary purpose of the Student Worksheet is to provide structured guidance that supports students in actively engaging with the learning material, particularly within the framework of PBL. Through the use of Student Worksheet, students are expected to develop critical thinking, problem-solving, and independent learning skills as they work through real-life contextual problems. The function of the Student Worksheet is to act as a learning tool that bridges the communication between teachers and students. It provides clear instructions, learning activities, and scaffolding that help students discover concepts through exploration, discussion, and collaboration—key aspects of PBL. Additionally, a well-designed Student Worksheet enables teachers to organize learning in a more student-centered manner, ensuring that the learning process is systematic, goal-oriented, and aligned with students' needs. (Sugiatno et al., 2025)In the specific case of SMPN L Sidoharjo, the development of a PBL-based mathematics Student Worksheet is essential to address current learning challenges and to create more meaningful, interactive, and effective learning experiences for students. (Fadilah & Effendi, 2023)The learning process is designed to guide students in solving problems systematically and logically. PBL encourages the development of students' creativity, as almost every step in the learning process requires active participation from the students (Satiti et al., 2023).

Problem-Based Learning (PBL) involves a structured set of steps that guide students through the process of learning by solving real-world problems. Wahyuningati & Mizan (2023) state that the first step is problem orientation, where the teacher introduces a contextual problem that is relevant to students' lives and aligned with the learning objectives. (Damanik et al., 2025)This problem is designed to stimulate curiosity and critical thinking. Next is problem identification and learning organization, where students work collaboratively to define the problem, identify what they already know, what they need to learn, and how they can approach the solution. In the third step, information gathering, students explore various resources—such as books, online materials, or expert interviews—to collect data related to the problem. (Anjasari & Rahaju, 2025)The teacher acts as a facilitator, guiding students in locating and evaluating useful information. After gathering sufficient information, students proceed to analyze and synthesize the data. They discuss their findings within their group, connect them to prior knowledge, and begin to formulate possible solutions. (Rehman et al., 2025)Following this is the solution development and presentation phase, where students design and present their proposed solutions in a structured format, such as a presentation, report, or project. This encourages communication skills and creative thinking.(Ating et al., 2023)

The final step is reflection and evaluation, where both students and the teacher reflect on the learning process, assess the effectiveness of the solution, and provide feedback on the

group collaboration and individual contributions (I. N. Sari & Sulisworo, 2023). This reflection is essential for reinforcing learning and developing metacognitive awareness (Hati & Alamsyah, 2024).

PBL provides a learning environment in which problems are used as the foundation for learning. Before students are introduced to the learning material, they are presented with a problem—either real-life or specifically designed—which they must first identify. Unlike conventional teaching methods where material is delivered one-directionally from teacher to student, PBL promotes independent learning and knowledge construction. Students are expected to explore, investigate, and construct their understanding collaboratively (Kusmayanti & Murtiyasa, 2024). By implementing the PBL model, students are presented with real-world problems at the beginning of the learning process that must be solved. Their critical thinking skills are essential in gathering and analyzing information to make well-informed decisions and solve the problems effectively (Ainiyah & Loviana, 2024).

The Student Worksheet (Student Worksheet) is one of the instructional tools that teachers need to develop. A Student Worksheet consists of information, directions, or instructions provided by the teacher to guide students in carrying out learning activities, which may involve hands-on practice or the application of knowledge to achieve specific learning objectives. Student Worksheets assist teachers in directing students to discover concepts through their own activities or group work. They serve as a communication tool between teachers and students, helping to convey learning content or instructions clearly. Therefore, the use of Student Worksheets should be carefully considered by teachers, as they can promote independent learning and support students in experiencing meaningful, student-centered education.(Amaliah et al., 2024)

The urgency of conducting this research lies in the current educational challenges faced in mathematics learning at SMPN L Sidoharjo. Traditional teaching methods, which are still widely applied, often fail to engage students actively or help them relate mathematical concepts to real-life contexts. As a result, students tend to become passive learners and struggle with problem-solving and critical thinking skills—competencies that are essential in the 21st century. In addition, the lack of innovative learning tools such as PBL-based Student Worksheets (Student Worksheet) makes it difficult for teachers to implement student-centered approaches effectively. Considering the shift in curriculum direction that emphasizes higher-order thinking skills, independent learning, and contextual understanding, it is crucial to align learning materials with these goals. This research is timely and relevant as it seeks to identify the actual needs of students and teachers, which will serve as a strong foundation for developing effective, engaging, and meaningful learning tools. By conducting this needs analysis now, the resulting PBL-based Student Worksheet can better support the improvement of mathematics learning outcomes and contribute to creating a more active and inquiry-based classroom environment at SMPN L Sidoharjo (Faidah et al., 2024).

METHOD

The type of research used in this study is qualitative descriptive research. This approach is appropriate for understanding and describing the actual conditions, needs, and challenges in the mathematics learning process at SMPN L Sidoharjo. The address of L. Sidoharjo State Middle School is on Jl. Puntodewo L Sidoharjo. Through qualitative methods, the research aims to gather in-depth information about students' and teachers' experiences, perceptions, and expectations regarding the use of Problem-Based Learning (PBL) in mathematics (Ernasari et al., 2025).

Picture 1. Qualitative Research Method

The descriptive nature of the study allows the researcher to analyze existing learning materials, classroom practices, and the availability of PBL-based Student Worksheet, with the goal of identifying gaps and formulating recommendations for the development of more effective, student-centered learning tools. (Ariska et al., 2024)Data were collected through interviews, observations, and document analysis, making it possible to provide a comprehensive picture of the current learning context and the specific needs for PBL-based mathematics worksheets. The subjects of this research consisted of one mathematics teacher and a group of students from a specific class at SMPN L Sidoharjo. The mathematics teacher was selected as a key informant to provide insights into the current teaching practices, challenges faced in implementing innovative learning models, and the availability and effectiveness of existing student worksheets. (Ernasari et al., 2025). Additionally, students from [mention specific class, eg, Grade VIII-1 were chosen as research subjects to represent the actual users of the Student Worksheet. Their perspectives were essential to understand learning difficulties, engagement levels, and needs related to problem-based learning (PBL) in mathematics. The combination of teacher and student input ensured a comprehensive understanding of the needs and conditions that would inform the development of a PBL-based mathematics Student Worksheet tailored to the context of SMPN L Sidoharjo (Ariska et al., 2024).

FINDINGS AND DISCUSSION

This study was undertaken with the primary objective of examining the specific needs of both educators and students in relation to the development of a Problem-Based Learning (PBL)-oriented mathematics student worksheet (Student Worksheet) at SMPN L Sidoharjo. The inquiry was directed toward identifying the prevailing conditions within the mathematics classroom, the pedagogical challenges encountered, and the potential value of integrating PBL strategies into mathematics instruction. To obtain a comprehensive understanding of the educational context, data were collected through a combination of interviews, classroom observations, and document analysis. The subsequent section outlines the results of the needs analysis, which serves as a foundational reference for the formulation of a more effective, contextually relevant, and student-centered PBL-based mathematics Student Worksheet.

Teachers' need for Student Worksheet that is contextual, interactive, and in accordance with the curriculum

Based on the findings from the needs analysis conducted at SMPN L Sidoharjo, it is evident that teachers have a strong need for student worksheets that are contextual, interactive, and aligned with the current curriculum. Many of the existing Student Worksheets are still generic and fail to reflect real-life situations that can help students understand mathematical concepts in a meaningful way. Teachers expressed the importance of contextual content that connects mathematical problems with students' everyday experiences, making learning more relevant and engaging.

In addition, teachers emphasize the need for Student Worksheets that are interactive—encouraging active student participation through group discussions, exploration activities, and critical thinking tasks. (Tumangger et al., 2024)Interactive Student Worksheets not only support the development of students' problem-solving skills but also foster collaboration and communication in the classroom. (Caniago & Lestari, 2023)Furthermore, alignment with the curriculum, particularly with the current *Merdeka Curriculum* , is essential to ensure that the Student Worksheets support the achievement of learning outcomes and competencies outlined by the national education standards. Therefore, the development of PBL-based mathematics Student Worksheets that integrate real-world contexts, promote interactive learning, and are curriculum-based is urgently needed to enhance the effectiveness of mathematics instruction at SMPN L Sidoharjo.

Students' Needs for Student Worksheet that Facilitates Understanding of Mathematical Concepts

One of the main findings from the needs analysis conducted at SMPN L Sidoharjo is that students require a Student Worksheet that can effectively support their understanding of mathematical concepts. Many students expressed difficulty in grasping abstract mathematical ideas through conventional teaching methods that rely heavily on direct instruction and textbook-based learning.(Salsabila et al., 2024)

They need learning materials that are more interactive, engaging, and contextual. An Student Worksheet based on the Problem-Based Learning (PBL) model is highly relevant to meet these needs, as it encourages students to explore real-world problems and construct their understanding through investigation and collaboration. This approach helps students link mathematical concepts with practical applications, making the learning process more meaningful and easier to understand. Furthermore, students indicated that step-by-step guidance, visual aids, and opportunities for group discussion within the Student Worksheet would significantly enhance their ability to understand and apply mathematical concepts. Therefore, developing a PBL-based Student Worksheet is essential to facilitate concept mastery and support active, student-centered learning at SMPN L Sidoharjo.

Expected Features and Components of PBL-Based Student Worksheet

Based on the needs analysis conducted at SMPN L Sidoharjo, the development of a PBL-based mathematics Student Worksheet should include features and components that align with the principles of Problem-Based Learning and address the learning challenges identified in the school context.(Nasution et al., 2024)

The expected Student Worksheet should consist of the following key components: 1) Problem Orientation Section; The Student Worksheet should start with a real-life or contextual problem that is relevant to students' daily experiences. This problem serves as a trigger for learning and should be open-ended to encourage critical thinking and exploration. 2) Learning Objectives; Clearly stated learning objectives that are aligned with the curriculum and competencies to be achieved. These help guide students toward the expected outcomes. (Yani & Yuzar, 2025). 3) Guiding Questions; A series of open-ended, scaffolded questions that guide students in understanding the problem, identifying what they need to learn, and directing their investigation. 4) Information Exploration Tasks; Activities that encourage students to gather data from various sources—such as textbooks, internet, or real-life observations. This component supports student independence and inquiry-based learning (Said et al., 2023). 5) Group Discussion and Collaboration Tasks; Tasks that require students to discuss, analyze, and synthesize their findings in groups. This promotes communication, collaboration, and deeper understanding through peer learning (Fina et al., 2023). 6) Problem-Solving and Decision-Making Activities; Activities that lead students to propose, test, and justify solutions based on the information they have collected and analyzed. 7) Reflection Section; A space for students to reflect on what they have learned, how they solved the problem, and how the knowledge can be applied in different contexts (Heriyanto et al., 2024).

Assessment and Feedback Section

Rubrics, self-assessment tools, or teacher feedback areas that help evaluate both the process and the final product of learning.(Rahmaningrum & Khosiyono, 2023) In addition to these components, the PBL-based Student Worksheet should be visually appealing, use student-friendly language, and be designed to foster engagement, autonomy, and critical thinking. The integration of these features is expected to improve the effectiveness of mathematics learning and support students in becoming more active and independent learners.(Nurmilawati, 2023)

Format, Appearance, And Types Of Questions Desired In The Student Worksheet

Based on the needs analysis conducted at SMPN L Sidoharjo, the desired format and appearance of the PBL-based Mathematics Student Worksheet should be clear, structured, and visually engaging to support student understanding and motivation. The layout should include distinct sections such as problem orientation, learning objectives, guiding questions, group discussion prompts, space for students' responses, and reflection. Visual elements such as tables, diagrams, and illustrations are also recommended to help students better interpret information and stay engaged with the content (Habib et al., 2023).

In terms of question types, the Student Worksheet should emphasize open-ended, contextual problems that stimulate critical thinking and allow for multiple solution strategies. The questions should be connected to real-life situations so that students can see the relevance of mathematical concepts in their daily experiences. In addition to problem-solving tasks, the Student Worksheet should include questions that promote collaboration, such as tasks that require students to discuss, compare, or defend their answers within a group. There should also be reflection questions at the end of the worksheet to encourage students to evaluate their understanding and the strategies they used. Overall, the Student Worksheet should be designed to actively involve students in the learning process, in line with the principles of Problem-Based Learning.

Suitability Of Student Worksheet With Student Learning Styles & PBL Approaches

The compatibility of student worksheets with students' learning styles and the Problem-Based Learning (PBL) approach is a crucial factor in achieving effective and meaningful learning outcomes. Based on the needs analysis conducted at SMPN L Sidoharjo, it was found that many existing Student Worksheets are still designed in a conventional format, which does not adequately accommodate diverse student learning styles, such as visual, auditory, or kinesthetic preferences. A well-developed PBL-based Student Worksheet should provide opportunities for students to explore problems through observation, discussion, hands-on activities, and independent inquiry. This aligns with the principles of PBL, which emphasize student-centered learning, collaboration, critical thinking, and problem-solving (Gunawan & Sudiansyah, 2025).

Incorporating multiple modes of engagement within the Student Worksheet—such as visual representations, guiding questions, group tasks, and space for reflection—can help address the varying needs of students and keep them actively involved throughout the learning process. Moreover, the use of real-life problems as a starting point allows students to connect the learning material with their own experiences, thereby increasing motivation and understanding. (Granello et al., 2025)Therefore, the development of a PBL-based mathematics Student Worksheet at SMPN L Sidoharjo must consider students' learning styles to ensure that the materials not only support the PBL approach but also enhance student engagement, comprehension, and independence in learning (Salsabila et al., 2023).

Classroom Observation Findings

Based on classroom observations conducted at SMPN L Sidoharjo, several important findings highlight the current conditions and challenges in the mathematics learning process. It was observed that learning activities were still dominated by teacher-centered approaches, where students mostly listened to explanations and completed exercises individually.

Opportunities for active learning, discussion, or collaborative problem-solving were minimal. As a result, student engagement appeared low, with only a few students participating actively, while others seemed passive and disengaged during the lesson (Irmayanti & Chou, 2025)

In addition, the instructional materials used, including student worksheets (Student Worksheet), were primarily focused on procedural exercises rather than encouraging conceptual understanding or real-world application. These worksheets did not facilitate student exploration or critical thinking, which are essential components of Problem-Based Learning (PBL). Moreover, when given a problem, students tend to rely on direct instruction from the teacher rather than attempting to investigate or discuss possible solutions independently or in groups. (Ayu et al., 2023)Another key finding was that students showed difficulties in connecting mathematical concepts to practical situations, indicating a gap between theoretical knowledge and contextual understanding. This suggests a need for instructional tools that not only align with the curriculum but also promote student independence, inquiry, and problem-solving skills. These observations confirm the necessity of developing a PBL-based mathematics worksheet that supports student-centered learning, fosters critical thinking, and bridges the gap between mathematics and its real-life applications (Witri et al., 2023).

Based on interviews conducted with mathematics teachers at SMPN L Sidoharjo, it was found that the current learning process still relies heavily on conventional teaching methods, where the teacher dominates the explanation and students play a passive role. Teachers acknowledged that many students struggle to understand abstract mathematical concepts and often lack motivation when the material is not connected to real-life contexts. Teachers also expressed the need for learning tools, such as student worksheets (Student Worksheet), that can encourage active student participation and foster critical thinking (Wahyuningati & Mizan, 2023).

Meanwhile, interviews with students revealed that they often find mathematics difficult and boring, particularly because they are not involved in activities that allow them to explore or apply mathematical concepts in a meaningful way. Many students stated that they preferred learning through group discussions and hands-on problem solving rather than listening to lectures or doing repetitive exercises (Istifadah et al., 2023). They also mentioned that existing Student Worksheets are mostly filled with practice questions and rarely present challenging, real-world problems that stimulate their thinking. Both teachers and students agreed on the importance of integrating real-life problems into the learning process to make mathematics more engaging and relevant. These findings indicate a clear need for the development of a PBL-based mathematics Student Worksheet that can support a more interactive, student-centered learning environment while improving students' problem-solving skills and conceptual understanding (Ainiyah & Loviana, 2024).

Based on the findings of the study entitled "*Needs Analysis for PBL-Based Mathematics Student Worksheet at SMPN L Sidoharjo*" , the school demonstrates a moderate level of readiness to support the development of PBL-based Student Worksheet. SMPN L Sidoharjo has shown a positive attitude toward implementing innovative learning models, including Problem-Based Learning, and there is a growing awareness among teachers of the importance of shifting from conventional approaches to more student-centered strategies. The availability of basic infrastructure, such as learning facilities, internet access, and digital tools, provides a foundational support system for the integration of PBL in the classroom (Amaliah et al., 2024).

Moreover, mathematics teachers at SMPN L Sidoharjo have expressed a willingness to adopt PBL strategies, although further training and professional development are still needed to strengthen their capacity in designing and facilitating PBL-based instruction effectively. (Ramadhan & Sumarni, 2025)However, one of the key challenges identified is the limited availability of PBL-oriented teaching materials, particularly Student Worksheets that are specifically designed to guide students through problem-solving activities. Therefore, while the school exhibits promising potential and a supportive environment, there is a need for continued investment in teacher training, collaborative curriculum development, and the

provision of learning tools to fully realize the benefits of PBL-based Student Worksheet in mathematics education (Hardi et al., 2023).

The findings of the needs analysis conducted at SMPN L Sidoharjo have significant implications for the design and development of a Problem-Based Learning (PBL)-based Mathematics Student Worksheet. First, the analysis revealed a strong need for learning tools that can promote student engagement, independent learning, and problem-solving skills. Therefore, the Student Worksheet must be designed to include real-world, contextual problems that are relevant to students' daily experiences. This ensures that the learning process becomes meaningful and motivates students to actively participate. Second, the findings highlighted that students often struggle with abstract mathematical concepts. As a result, the Student Worksheet should incorporate guided steps that help students gradually understand and solve problems through observation, discussion, and reflection. Visual aids, examples, and scaffolding questions can support this process and enhance conceptual understanding. Additionally, the current lack of interactive and collaborative activities in the classroom suggests the need for Student Worksheet tasks that promote teamwork, discussion, and peer learning.

Activities should be structured to allow students to work in groups, share ideas, and build solutions together, in alignment with PBL principles. Lastly, the analysis showed that teachers require practical tools that align with the curriculum and are easy to implement. Therefore, the developed Student Worksheet must also include clear instructions, learning objectives, and assessment rubrics to guide both teachers and students. In conclusion, the findings inform the creation of a PBL-based Student Worksheet that is student-centered, inquiry-driven, and effective in enhancing mathematical thinking and problem-solving abilities.

Based on the findings from the needs analysis conducted at SMPN L Sidoharjo, the implementation of Problem-Based Learning (PBL) in mathematics presents both significant strengths and several challenges. One of the key strengths of PBL is its ability to promote active and student-centered learning. Through PBL, students are encouraged to explore, question, and apply mathematical concepts in real-life contexts. This leads to deeper conceptual understanding, enhances critical thinking, and improves problem-solving skills—all of which are essential in mathematics. PBL also encourages collaboration and communication among students, as they work together in groups to investigate problems and develop solutions. Furthermore, students become more engaged and motivated because they see the relevance of mathematics to everyday life (Caniago & Lestari, 2023).

However, despite these advantages, the implementation of PBL also presents several challenges. At SMPN L Sidoharjo, one of the main challenges identified was the lack of PBL-oriented learning materials, such as worksheets (Student Worksheet) that support problem-solving activities. Additionally, some students struggle with adapting to the student-driven learning environment, as they are more accustomed to traditional teacher-centered instruction. This shift requires a higher level of independence, initiative, and critical thinking, which may not be fully developed in all learners. Another challenge is related to the teachers' readiness and experience in applying the PBL model. Some educators may lack sufficient training or confidence in designing and facilitating PBL lessons effectively. Time constraints within the school schedule and the need for adequate classroom resources also pose limitations to the full implementation of the model. While PBL offers great potential to enhance mathematics learning through meaningful, real-world problem-solving experiences, its effective implementation requires well-designed learning tools, teacher preparation, and gradual adaptation by students. The development of a PBL-based mathematics Student Worksheet that aligns with the needs of students and teachers at SMPN L Sidoharjo is therefore essential to support and optimize the application of this approach in the classroom (Patra & Rakhman, 2024).

The results of the needs analysis conducted at SMPN L Sidoharjo indicate that a PBL-based Student Worksheet format is well-aligned with the diverse learning styles of students. In the classroom, students demonstrate varying preferences in how they absorb and process

information—some prefer visual aids, others learn better through hands-on activities, and many benefits from collaborative group work. The structure of Problem-Based Learning naturally accommodates these differences. By presenting contextual problems, encouraging exploration, promoting discussion, and guiding students to develop solutions, the PBL-based Student Worksheet supports visual, auditory, and kinesthetic learning styles. Furthermore, the step-by-step nature of PBL—from identifying the problem to presenting solutions—helps students engage in active learning and take ownership of their understanding. Visual learners benefit from diagrams, charts, and organized problem scenarios; auditory learners gain from group discussions and oral presentations; while kinesthetic learners are supported through hands-on problem-solving and project-based tasks (Sinaga et al., 2024). Thus, the PBL-based Student Worksheet format not only matches but also enhances students' individual learning styles, making the learning process more meaningful, interactive, and student-centered.

The Need For Visual Or Digital Media

One of the key findings from the needs analysis conducted at SMPN L Sidoharjo was the urgent need for the integration of visual and digital media in mathematics learning. In the current learning environment, many students struggle to understand abstract mathematical concepts when they are presented only through text or verbal explanation. Visual media such as diagrams, graphs, animations, and interactive simulations can help bridge this gap by providing concrete representations of mathematical ideas. Additionally, the integration of digital tools—such as educational apps, interactive worksheets, or multimedia-enhanced Student Worksheets—can increase student engagement and motivation. These media not only support diverse learning styles but also align with the characteristics of today's digital-native students. In the context of Problem-Based Learning (PBL), the use of visual and digital media is even more crucial, as students are required to explore, investigate, and communicate their ideas effectively. Therefore, to enhance the effectiveness of PBL-based mathematics Student Worksheet, it is essential to incorporate visual and digital media that facilitate interactive and meaningful learning experiences (Mufliva et al., 2023).

Support for Technology Use

The integration of technology plays a vital role in supporting the development and implementation of PBL-based mathematics learning at SMPN L Sidoharjo. Based on the needs analysis conducted, it was found that both teachers and students expressed a strong interest in using digital tools to enhance the learning process. Technology can facilitate access to learning resources, support interactive learning environments, and assist in the presentation and visualization of mathematical concepts. For example, the use of educational platforms, video tutorials, simulation apps, and collaborative tools such as Google Workspace can help students gather information, communicate effectively, and present their problem-solving results more creatively (Oktaviana et al., 2024). In addition, technology allows for more personalized and flexible learning experiences, which aligns well with the student-centered nature of Problem-Based Learning. Teachers also benefit from technological support, as it enables them to design more dynamic and engaging Student Worksheets, distribute learning materials efficiently, and monitor students' progress in real-time. However, the analysis also revealed the need for further training and guidance for teachers to optimize the use of available technology in the classroom. Therefore, integrating appropriate technological tools with appropriate teacher support is essential to successfully implementing PBL-based Student Worksheets and achieving meaningful mathematics learning outcomes (E. M. Sari et al., 2024).

Availability Of School Facilities For Technology-Based Media

Based on observation and preliminary data, SMPN L Sidoharjo shows moderate readiness in terms of technological infrastructure. The school has access to basic digital tools such as projectors, several internet-connected computers, and Wi-Fi in specific areas. However, the availability and integration of technology in classrooms are still limited. Not all classrooms are equipped with devices that support interactive or digital learning, and the

internet connection is not always stable across the entire school environment.(Widiyarsih et al., 2023)

This limitation presents a challenge in implementing technology-enhanced learning tools, including digital or interactive versions of PBL-based Student Worksheets. Furthermore, some teachers and students are still in the process of adapting to the use of digital platforms in learning (Wahyuningati & Mizan, 2023). While there is a growing awareness of the importance of technology in education, the school requires further development in terms of infrastructure, training, and consistent access to digital learning tools to fully support a technology-integrated PBL approach. These findings highlight the need for blended solutions—such as print-based Student Worksheets with optional digital enhancements—that can accommodate the current level of school facility readiness while progressively moving towards a more technology-integrated learning environment (R. N. Sari et al., 2024).

Long-term Benefits if PBL-based Student Worksheet is widely implemented at SMPN L Sidoharjo

The long-term implementation of PBL-based Student Worksheet in mathematics learning at SMPN L Sidoharjo and other schools has the potential to bring about significant educational benefits. First, it fosters students' critical thinking, creativity, and problem-solving abilities—skills that are essential for success in the 21st century. Over time, students will become more independent and confident learners, capable of analyzing real-world problems and finding logical, evidence-based solutions. In addition, continuous exposure to PBL environments enhances collaboration and communication skills, as students are required to work in teams, share ideas, and evaluate diverse perspectives (Ating et al., 2023)

From a pedagogical perspective, PBL-based Student Worksheet encourages a shift from teacher-centered instruction to a more student-centered approach, promoting active engagement and deeper understanding of mathematical concepts (Hati & Alamsyah, 2024). This method also supports long-term retention of knowledge, as students learn by doing, experiencing, and reflecting—rather than by memorization. Moreover, teachers can benefit from improved classroom dynamics, as students become more motivated and take greater ownership of their learning process (Ainiyah & Loviana, 2024). On a broader scale, the widespread use of PBL-based Student Worksheet can contribute to the creation of a learning culture that values inquiry, exploration, and lifelong learning. As students develop transferable skills through meaningful learning experiences, they are better prepared to face academic challenges, further education, and future careers. Therefore, the integration of PBL-based Student Worksheet not only improves learning outcomes in mathematics but also supports the holistic development of students in the long run.

The Potential for Collaboration with Mathematics Learning Communities

In the context of the research entitled "*Needs Analysis for PBL-Based Mathematics Student Worksheet at SMPN L Sidoharjo*" , collaboration with learning communities such as the Mathematics Subject Teacher Working Group (MGMP) holds significant potential. MGMP serves as a professional platform for mathematics teachers to share experiences, best practices, and innovative teaching strategies. (Faidah et al., 2024)Engaging in collaboration with MGMP can enhance the quality and relevance of the PBL-based Student Worksheet development process by allowing for the exchange of ideas, feedback, and alignment with the current curriculum and classroom realities (Hardi et al., 2023) .

Through active participation in MGMP discussions or workshops, teachers can gain valuable insights into the common challenges faced in teaching mathematics, particularly in implementing student-centered learning models such as Problem-Based Learning. Additionally, MGMP can facilitate peer review of the Student Worksheet drafts, ensuring the content is not only pedagogically sound but also practical and applicable in diverse classroom settings (Fatma et al., 2024).

Furthermore, MGMP can act as a dissemination channel, helping to introduce and promote the use of the developed Student Worksheet across other schools in the region. This

collaboration encourages the sustainability and scalability of the innovation, allowing more educators to benefit from the resource and continuously improve it based on collective input and classroom experience (Mardia & Putri, 2024).

In the *Needs Analysis for PBL-Based Mathematics Student Worksheet at SMPN L Sidoharjo* , several challenges and limitations have been identified that could affect the successful implementation of Project-Based Learning (PBL). One of the main challenges is the time constraints within the curriculum, as PBL often requires more time for planning, project execution, and assessment compared to traditional methods. This may conflict with the rigid school timetable, limiting the ability to fully integrate PBL. Additionally, resource limitations such as a lack of adequate technology, teaching materials, or internet access pose significant barriers to the effective implementation of PBL-based projects (Fakhruddin & Martadiputra, 2025). Many students and teachers may also lack the necessary skills and training to successfully apply PBL in mathematics instruction, as the teachers may not be familiar with PBL techniques. Furthermore, there may be resistance to change from both teachers and students who are accustomed to traditional, teacher-centered learning. The current curriculum structure also tends to focus on theoretical and practice-based learning, which may not support the flexibility required for PBL (Febriani et al., 2024). Moreover, assessment challenges arise since traditional exams do not fully measure the skills developed through PBL, such as collaboration, problem-solving, and critical thinking. Finally, there may be a lack of administrative support and proper management, including scheduling and resource allocation, which could hinder the smooth implementation of PBL. These constraints must be addressed in order to effectively integrate PBL into the mathematics curriculum at SMPN L Sidoharjo.

CONCLUSIONS

Based on the needs analysis conducted at SMPN L Sidoharjo, it is evident that there is a significant gap between the current state of mathematics learning and the ideal instructional approach aligned with Problem-Based Learning (PBL). The existing Student Worksheets are primarily conventional and procedural, lacking elements that foster critical thinking, collaboration, and real-world problem-solving. This discrepancy underscores the urgent need to develop PBL-based Student Worksheets tailored to the specific learning needs of students. These worksheets should move beyond rote exercises and serve as comprehensive learning tools that promote inquiry, exploration, and meaningful engagement with mathematical concepts. By integrating contextual problems and guiding students through key PBL stages—such as problem orientation, investigation, and solution development—the worksheets can enhance student-centered learning and 21st-century skill development. Clear instructions, visual aids, reflection spaces, and collaborative tasks should be incorporated to support diverse learners and encourage independent learning. Additionally, effective implementation of PBL requires teacher readiness; therefore, professional development for educators is essential to maximize the impact of the new worksheets. Feedback-driven refinement should also be a continuous process to ensure the materials remain relevant and effective. In conclusion, the development of a PBL-based Student Worksheet is a necessary and strategic solution to bridge the gap between current classroom practices and ideal pedagogical goals. This innovation not only addresses the academic needs at SMPN L Sidoharjo but also aligns mathematics instruction with modern educational standards that emphasize active participation, creativity, and problem-solving, ultimately fostering a more meaningful and engaging learning experience for students.

REFERENCES

Ainiyah, N., & Loviana, S. (2024). Development of Student Worksheets (LKPD) Based on Ethnomathematics on Transformation Material. *Al-'Adad: Jurnal Tadris Matematika* , *3* (2), 243–256.

Amaliah, F., Bulan, D., & Bestari, H. (2024). Development of Electronic Student Worksheets (E-Lkpd) with the Indonesian Realistic Mathematics Education Approach Assisted by Liveworksheets. *Majamath: Journal of Mathematics and Mathematics Education* , *7* (2), 151–166.

Anjasari, T., & Rahaju, E.B. (2025). Junior High School Students' Numeracy In Solving Number Content Akm Problems Based On Mathematical Ability. *Mathedunesa* , *14* (1), 195–212.

Ariska, N., Susanta, A., & Juarsa, O. (2024). Lkpd Based on Project Based Learning in the Context of the School Environment to Improve Mathematics Learning Outcomes of Grade IV Elementary School Students. *Journal of Elementary Education Learning and Teaching* , *7* (2), 205–212.

Ating, FC, Bistari, B., Salimi, A., Halidjah, S., & Tampubolon, B. (2023). Development of Pjbl-Based Student Worksheets in Mathematics Learning to Improve Responsible Attitudes in Grade V Elementary Schools. *Fondatia* , *7* (1), 200–210.

Ayu, D., Damanik, AS, Rangkuti, SA, Sari, R., & Rizqi, NR (2023). Development of Student Worksheets (LKPD) in Mathematics with Problem Based Learning (PBL) Model to Improve Critical Thinking Skills. *Journal of Learning and Mathematics Sigma (Jpms)* , *9* (2), 177–187.

Caniago, AH, & Lestari, N. (2023). Development of Project-Based Lkpd in Mathematics Subjects Learning the Area of Simple Plane Shapes in Grade V Elementary School. *Journal of Research Innovation* , *3* (9), 7764–7793.

Damanik, TAP, Julyanti, E., & Pasaribu, LH (2025). Analysis Of The Mathematical Concept Understanding Ability Of VII Grade Junior High School Students. *Edumatsains: Journal of Education, Mathematics and Science* , *9* (2), 55–65.

Ernasari, T., Suminar, T., Andaryani, E.T., Avrilianda, D., & Subali, B. (2025). Systematic Literature Review: A Problem-Based Learning Approach In The Application Of Mathematics Learning At Primary School Age. *Paedagoria: Journal of Educational Studies, Research and Development* , *16* (2), 106–113.

Fadilah, SR, & Effendi, KNS (2023). Analysis of the Needs of Interactive Lkpd on Junior High School Algebra Material During Online Learning. *Teorema: Mathematical Theory and Research* , *8* (1), 41–52.

Faidah, N., Usman, H., & Yarmi, G. (2024). Analysis of the Needs for the Development of Genre-Based Interactive Indonesian Language E-Lkpd in Elementary Schools. *Sap (Educational Articles Compilation)* , *9* (2), 225–233.

Fakhruddin, YH, & Martadiputra, BAP (2025). The Impact Of Problem-Based Learning On Mathematics Education: A Systematic Literature Review. *Edutec: Journal Of Education And Technology* , *8* (3).

Fatma, HY, Hamdunah, H., & Suryani, M. (2024). Development of Differentiated E-Lkpd on Probability Material in Grade X Phase E of Sma Negeri 3 Padang. *Equation Journal: Theory and Research in Mathematics Education* , *7* (2), 14–28.

Febriani, IRF, Rahaju, EB, Ekawati, R., & Shodikin, A. (2024). Statistics Flip-Worksheet: The Key To Improve Students' Critical Thinking Skills. *Journal Of Mathematical Pedagogy (Jomp)* , *5* (2), 76–90.

Fina, ID, Mustaji, M., & Dewi, U. (2023). Analysis of E-Lkpd Needs Based on Problem Based Learning for Science Learning for Junior High School Grade VIII. *Oryza (Journal of Biology Education)* , *12* (2), 173–181.

Granello, F., Cuder, A., Doz, E., Pellizzoni, S., & Passolunghi, M. C. (2025). Improving Mathematics Self-Efficacy and Mathematics Self-Concept in Middle School: A Narrative Systematic Review. *European Journal Of Psychology Of Education* , *40* (1), 42.

Gunawan, ASA, & Sudiansyah, S. (2025). A Descriptive Study Of Junior High School Students' Challenges And Strategies In Understanding Indonesian Symbols And Language In Mathematics Learning. *Cosmos: Journal of Educational Sciences, Economics And Technology* , *2* (2), 249–267.

Habeahan, WL, Malik, M., Firdaus, MH, & Panjaitan, AC (2025). The Influence Of Cognitive Style On Abstraction Ability And Mathematical Problem-Solving In Problem-Based Learning. *Alacrity: Journal Of Education* , 554–561.

Habib, PA, Arsil, A., & Febrianto, A. (2023). Lkpd Design in Mathematics Learning in the Implementation of the Independent Curriculum in Grade I of Elementary School. *Journal of Elementary Education Milestones: Journal of Elementary Education Theory and Results Studies* , *2* (1), 52–62.

Hardi, VA, Amelia, S., Effendi, LA, Zetriuslita, Z., & Oskandar, Y. (2023). Development of Open-Ended Based Student Worksheets (Lkpd) on Quadrilateral Material for Grade VII. *Jurnal Cendekia: Journal of Mathematics Education* , *7* (1), 490–502.

Hati, H., & Alamsyah, TP (2024). Development of LKPD Based on Problem Based Learning in Mathematics Subjects in Grade 2 of Elementary School. *Koordinat Jurnal Mipa* , *5* (1), 21–30.

Heriyanto, D., Rusdi, R., & Yantoro, Y. (2024). Analysis of E-Lkpd Development Needs to Increase Student Interest in the Mathematics Learning Process. *Math Didactic: Journal of Mathematics Education* , *10* (1), 83–92.

Irmayanti, M., & Chou, L.-F. (2025). Storytelling And Mathematics Anxiety: A Review Of Storytelling Methods In Mathematics Learning In Asian Countries. *European Journal Of Psychology Of Education* , *40* (1), 1–26.

Istifadah, Z., Nuryadi, N., & Saadah, FN (2023). Analysis of Mathematics Teaching Material Needs Based on Realistic Mathematics Education to Stimulate Numeracy Literacy Skills of Grade VII Junior High School Students. *Proceedings of the National Seminar on Mathematics and Statistics* , *3* (01), 62–67.

Kusmayanti, H., & Murtiyasa, B. (2024). React-Based Mathematics E-Lkpd: Improving Mathematical Problem Solving Skills. *Theorem: Mathematical Theory and Research* , *9* (1), 27–38.

Mardia, A., & Putri, RII (2024). Design Worksheets Math Trail To Outdoor Learning Mathematics. *Proceedings Of International Conference On Education* , *2* (1), 270–274.

Mariani, D., & Dewi, U. (2025). Literature Study: The Effect Of The Problem-Based Learning Model Assisted By The Flipped Classroom On Mathematical Creative Thinking Ability. *Indonesian Education Journal* , *6* (1).

Mufliva, R., Fitriani, AD, & Iriawan, SB (2023). Development of Lkpd Based on the "Merdeka" Flow as Strengthening Numeracy Literacy in the Implementation of Differentiated Learning in Elementary Schools. *Dwija Cendekia: Journal of Pedagogical Research* , *7* (3).

Nasution, UDR, Gandamana, A., Sitohang, R., Mailani, E., & Aulia, SM (2024). Development of Student Worksheets Based on Problem Based Learning to Improve Critical Thinking Skills of Fifth Grade Students of Sd Negeri 050631 Tanjung Keliling. *Tambusai Education Journal* , *8* (1), 288–301.

Nurmilawati, N. (2023). Development of Student Worksheets (Lkpd) Based on Islamic Character in Mathematics Subjects on Fraction Material in Class III Mis Islamiyah Sei Kamah II. *Analysis* , *1* (2), 246–254.

Oktaviana, E., Aima, Z., & Ramadoni, R. (2024). Development of E-Lkpd Based on Project Based Learning (Pjbl) Assisted by Liveworksheet Application on Linear Program Material for Class X Smk. *Juring (Journal For Research In Mathematics Learning)* , *7* (1), 31–44.

Patra, TNTPA, & Rakhman, A. (2024). *Development of Student Worksheets (Lkpd) Mathematics Based on Independent Flow on the Material of Building Forms for Grade 1 Elementary Schools* .

Putri, ZY (2025). System Literature Review: Improving Problem Solving Ability And Students' Mathematical Disposition In The Implementation Of Pbl Learning Models Supported Mathematics Trails. *Proceedings of the National Unnes Mathematics Student Seminar* , 462–473.

Qi, C., Zuo, S., & Liu, L. (2025). Curricular Notification In Chinese Lesson Study: Teachers' Interactions With Textbooks For Project-Based Learning. *Zdm–Mathematics Education* , 1–15.

Rahayu, SM (2025). Enhancing Students' Interest In Learning Mathematics Through The Implementation Of Problem-Based Learning: A Classroom Action Research. *Perpendicular: Journal Of Mathematics Education And Learning , 1* (1), 31–39.

Rahmaningrum, KK, & Khosiyono, BHC (2023). Analysis of the Needs for Developing STEM-Based Lkpd in Mathematics Content for Grade III Elementary Schools. *Journal of Science Education , 13* (2), 454–458.

Ramadhan, FA, & Sumarni, W. (2025). Development Of Interactive E-Worksheet Based On Stem-Integrated Problem-Based Learning To Improve Student's Problem-Solving Abilities. *The 8th International Conference On Education Innovation (Icei 2024)* , 745–759.

Rehman, N., Huang, X., & Mahmood, A. (2025). Changing Students' Attitude Towards Learning Mathematics Through Project-Based Learning: A Mathematics Project. *South African Journal Of Education , 45* (1), 1–14.

Said, FF, Susanto, A., & Utami, NP (2023). Development of Effective Student Worksheets (Lkpd) Assisted by Canva. *Soulmath Scientific Journal: Journal of Mathematics Education , 11* (1), 85–98.

Salsabila, NH, Sripatmi, S., Tyaningsih, RY, Novitasari, D., & Triutami, TW (2023). Analysis of Student Activity Sheet Needs Based on Problem Based Learning Model in Junior High School Mathematics Learning. *Evolution: Journal Of Mathematics And Sciences , 7* (1), 43–52.

Salsabila, NH, Sripatmi, S., Tyaningsih, RY, Novitasari, D., & Triutami, TW (2024). LKPD Based on Problem Based Learning Model Oriented to Numeracy Ability: How Do Students Respond? *Mathematics Education Media , 12* (1), 30–36.

Sari, EM, Misdalina, M., & Septiati, E. (2024). Development of Project Based Learning (Pjbl) Based Student Activity Sheets on Flat-Sided Space Material for Grade VIII Students. *Jurnal Cendekia: Jurnal Pendidikan Matematika , 8* (1), 634–645.

Sari, IN, & Sulisworo, D. (2023). Development of Augmented Reality-Based Lkpd as a Mathematics Learning Media. *Jnpm (National Journal of Mathematics Education) , 7* (1), 1–11.

Sari, RN, Rosjanuardi, R., Herman, T., Isharyadi, R., & Balkist, PS (2024). Development Of Mathematics Interactive E-Worksheet. *The Eurasian Proceedings Of Science Technology Engineering And Mathematics , 28* , 317–325.

Satiti, WS, Hidayati, A., Qoyum Zuhriawan, M., Wahab Hasbullah Jombang, KA, & Timur, J. (2023). Development of Inquiry-Based Student Worksheets on Social Arithmetic Material for Grade VII Students. *Pythagoras: Journal of Mathematics Education Study Program , 12* (1), 71–84.

Sinaga, DM, Simanjuntak, PL, Tambunan, IF, Mailani, E., & Saragih, DI (2024). Design of Mathematics Student Worksheets Based on Local Culture. *Journal of Multidisciplinary Education , 7* (11).

Sugiatno, S., Ridwan, R., Sinaga, YDK, & Nuban, A. (2025). Understanding Middle School Math: Cool Problems To Get Students Thinking And Connecting. *Canadian Journal Of Science, Mathematics And Technology Education* , 1–6.

Triyani, R., Pamungkas, AS, & Santosa, CAHF (2024). Development of Liveworksheet-Based Mathematics E-Lkpd in Supporting Differentiated Learning for Junior High School Students. *Delta-Pi: Journal of Mathematics and Mathematics Education , 13* (1), 34–52.

Tumangger, WR, Khalil, IA, & Prahmana, RCI (2024). The Impact Of Realistic Mathematics Education-Based Student Worksheet For Improving Students' Mathematical Problem-Solving Skills. *Indomath: Indonesian Mathematics Education , 7* (2), 196–215.

Wahyuningati, NR, & Mizan, S. (2023). Analysis of the Suitability of LKPD with the Problem Based Learning Model at Sdn Bareng 1 Malang. *Elenor: Elementary School Journal , 1* (2), 64–73.

Widiyarsih, T., Farida, N., & Sudarman, SW (2023). Development of E-Lkpd Assisted by Liveworksheet Trigonometry Material. *Emteka: Journal of Mathematics Education , 4* (1), 96–113.

Witri, A., Dewi, S., Fitriani, S., & Simamora, R. (2023). Development of Student Worksheets (Lkpd) in Mathematics Using Construct 2 Software at Smpn 02 Jambi City. *Phi: Journal of Mathematics Education* , *7* (2), 201–208.

Yani, M., & Yuzar, MG (2025). Application Of Treffinger Learning Model Towards Mathematical Creative Thinking Ability Of Junior High School Students. *Peka Journal (Mathematics Education)* , *8* (2), 235–245.