The Need for Interactive PjBL E-Worksheets in Deep Learning of Flat Shapes Material for 4th Grade Elementary School

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ABSTRACT

Given the lack of variety in existing learning instruments and the high level of student interest in digital learning, the objective of this study was to describe the needs for developing an interactive electronic Student Worshee that is both relevant to student requirements and aligned with the principles of Project-Based Learning (PjBL) to support deep learning. The methodology employed was quantitative descriptive research, involving 25 students and two teachers from SD Negeri 42 Bengkulu City, who participated through questionnaires and interviews. The results indicate that the majority of students responded positively to the use of E-Worksheets in the teaching and learning process, with 20 students stating that the problems within the E-Worksheets fostered their enthusiasm. Despite this positive sentiment, the data also highlighted the necessity for improving the variety of E-Worksheets content to better match student proficiency. The implication of this research is that the development of the e-E-Worksheets can enhance student engagement, facilitate more profound learning, and prepare students for future academic challenges by integrating active learning methods with modern technology. Thus, the development of PjBL-based E-Worksheets is expected not only to improve academic outcomes but also to build a sustained love for learning among students.

Keywords: Needs Analysis; E-Worksheets; PjBL; Deep Learning

INTRODUCTION

In the 21st century, education is undergoing a significant transformation that aligns with the rapid development of information and communication technology (ICT). Mardatillah (2024) explains that technological advancement has directly impacted both information delivery methods and the creation of teaching materials. The use of technology in education not only facilitates content delivery but also enhances interactivity and student engagement in the teaching and learning process. This aligns with global demands which expect graduates to possess 21st-century skills, such as critical thinking, collaboration, communication, and creativity (Yandari et al., 2023). Education in this century emphasizes the importance of student-centered learning, encouraging students to actively participate in the learning process rather than being passive recipients of information (Noza, 2023).

The learning focus in the context of deep understanding is the concept of Deep Learning, designed to develop students' holistic and sustainable comprehension (Yusnia, 2025). Deep Learning, as explained by Hasanah and Pujiati (2025), encourages students to internalize subject matter in a more reflective and meaningful way. This approach does not rely solely on memorization but focuses on grasping broader concepts, allowing students to connect acquired knowledge with their own experiences. Thus, learning also emphasizes students' ability to apply and analyze information across various contexts (Ghasya et al., 2021). For effective learning, it is crucial to create an environment that supports exploration and discovery, enabling students to learn in a way that suits their individual learning styles (Meka, 2024).

One effective method for implementing Deep Learning is Project-Based Learning (PjBL). PjBL is an approach focused on engaging students in real-world relevant projects, fostering collaboration and communication among them. Ayuni et al. (2025) state that PjBL provides students with the opportunity to explore practical solutions to existing problems, while simultaneously developing critical thinking skills. This approach not only enhances students' academic skills but also prepares them to face real-world challenges creatively and innovatively. PjBL allows students to actively participate in their own learning experiences, so the more involved they are, the deeper their understanding of the subject matter becomes (Agnafia & Anfa, 2025).

In the context of basic education, Student Worksheets (LKPD) are an important resource to support the learning process. Electronic-based worksheets, or e-LKPD, offer an interactive and engaging platform for students to learn various concepts. Hardanti et al. (2024) conclude that the use of e-LKPD can increase learning effectiveness and enable students to learn independently. The function of LKPD as a learning support also serves to cultivate students' critical thinking and problem-solving skills in learning activities, consistent with broader educational goals. By integrating the PjBL approach into the LKPD, it is hoped that students can become more proactive in exploring problems and formulating innovative solutions (Mardiana & Ahmatika, 2023).

The development of e-LKPD utilizing the PjBL model must consider students' needs to adapt instruction in line with technological advancements and the demands of the times. Junaidi et al. (2021) indicate that the application of interactive LKPD can help students better understand and apply the concepts taught. By combining elements of technology and sound pedagogy, the design of this LKPD aims to facilitate a richer and more diverse learning experience for students, which in turn can encourage a deeper mastery of the material (Wahyuni et al., 2024). The results of this development are expected not only to contribute to students' academic achievement but also to foster a love for learning (Agustin, 2025).

In the context of teaching flat shapes material for 4th-grade elementary school, the importance of developing PjBL-based e-LKPD as a teaching aid becomes even more prominent. By focusing on the development of interactive and integrated LKPD, it is expected to maximize learning outcomes and support deep learning for students. Through needs analysis and conducted studies, this development has the potential to create teaching material that is not only beneficial but also enjoyable for students, encouraging them to become lifelong learners ready to face future challenges (Supriatin et al., 2022; Feziyasti et al., 2024).

METHOD

The present study employed a descriptive research design utilizing a quantitative approach. The subjects involved comprised 4th-grade students from SD Negeri 42 Bengkulu City, with a sample size of 25 students who completed questionnaires, along with two teachers who served as interview respondents. The selection of the sample was conducted

through purposive sampling, a technique targeting specific individuals based on predetermined research criteria. The research process encompassed several crucial stages, beginning with problem identification, where the researcher aimed to clearly define the focus of the investigation. This was followed by a literature review to collect and analyze relevant theoretical sources from various academic publications and textbooks. Data collection was performed via the direct distribution of questionnaires to the students and in-depth interviews with the teachers. The designed questionnaire aimed to map students' learning experiences and the teaching tools implemented by the teachers. Furthermore, the survey included questions regarding students' needs for a digital Student Worksheet (LKPD) focused on the Deep Learning approach. The interviews conducted with the teachers sought a deeper understanding of the teaching methodologies applied, as well as the specific worksheets and learning approaches they currently use.

This was essential for exploring students' readiness to utilize the interactive LKPD currently under development, with the goal of creating a more informative and effective learning process. Amidst the newly implemented *Kurikulum Merdeka* (Independent Curriculum) in schools, this research contributes to gaining a clearer picture of the challenges faced by educators and students in adopting innovative learning approaches. Consequently, the findings of this study are expected not only to benefit the development of the E-LKPD but also to encourage curriculum refinement that accommodates the needs of students in the region. The existence of a platform based on local wisdom is posited as a key factor in creating a contextual learning process, transforming education not merely into a transfer of knowledge, but also a path for the preservation of local culture among the younger generatio

RESULT AND DISCUSSION

In the context of Mathematics instruction at school, the utilization of Student Worksheets (LKPD) serves as a crucial arena for enhancing student engagement and comprehension of the material being taught. The data to be presented below reflects students' perspectives and experiences regarding the use of LKPD in Mathematics learning. In the conducted survey, we identified the number of respondents who felt that the LKPD utilized was aligned with the teaching methods employed by the teacher. Overall, these results aim to understand the level of student engagement and the effectiveness of LKPD in supporting Mathematics learning, as well as how these factors contribute to students' motivation in this subject area. The table presented below will provide a more comprehensive overview of students' perceptions regarding the utility and efficacy of LKPD in their learning process. The following table presents the results of the student needs questionnaire:

Table 1. Results of the Student Needs Analysis

No.	Pertanyaan	Yes	No
1.	When learning Mathematics, does your teacher use LKPD (Student Worksheets)?	10	15
2.	Does the Mathematics LKPD (Student Worksheets) you have contain only problems from the textbook provided by the school?	17	8
3.	Can you complete the assignments in this book without difficulty?	12	13
4.	Do the existing problems make you enthusiastic about learning Mathematics?	20	5
5.	Do you own LKPD (Student Worksheets) for subjects other than the book provided by the school?	9	16
6.	Do you enjoy working on Mathematics problems?	16	9

Table 1. Results of the Student Needs Analysis

No.	Pertanyaan	Yes	No
7.	Do you enjoy solving the problems contained in the Mathematics LKPD (Student Worksheets)?	19	6
8.	Do you like the learning activities conducted by your teacher using the Mathematics LKPD (Student Worksheets)?	19	6
9.	Have you ever searched for information on the internet?	14	11
10.	Do you enjoy watching Mathematics instructional videos on YouTube?	20	5

The presented table contains data reflecting student responses concerning the use of Student Worksheets (LKPD) in Mathematics instruction. The survey results indicate that the majority of students express interest in the use of LKPD, particularly in the context of the problems provided within the learning activity. Regarding the first question, 10 students confirmed that their teachers use LKPD, while 15 students did not. This suggests that there is still room for improvement in integrating LKPD within mathematics classrooms, considering the importance of this tool in helping to organize students' knowledge and facilitating collaboration between students and teachers (İnan & ERKUŞ, 2017).

Furthermore, the second question reveals that out of 25 respondents, 17 students reported that their LKPD primarily contains problems sourced only from the school-provided textbooks. This raises concerns regarding the diversity of learning resources necessary for students to grasp mathematical concepts more comprehensively. Research suggests that the use of varied LKPD can enhance students' learning achievement (Septian et al., 2019). Additionally, 20 students felt that the problems in the LKPD boosted their enthusiasm for learning, indicating a positive correlation between the type of problems presented and students' learning motivation (Ragilena et al., 2022).

A portion of the students expressed their ability to complete tasks without difficulty, with 12 students answering "yes" and 13 students answering "no." This indicates potential for improvement in the LKPD design to better align with students' proficiency levels (Suhandri & Sari, 2019). An additional question regarding students' preference for activities involving LKPD showed that the majority, 19 out of 25 students, enjoy learning using the worksheets. This is consistent with research stating that the use of LKPD in active learning helps students become more engaged (Sawilda et al., 2022).

The importance of independent information seeking, as queried in the survey, was also highlighted by the indicator that 14 students have previously searched for information online. Moreover, the question concerning students' interest in watching instructional videos on YouTube reflects a tendency among students to seek more varied learning resources outside the classroom, aligning with research on technological advancements in education (Khikmiyah, 2021). In conclusion, the data analysis from this table provides valuable insight into the effectiveness of LKPD usage in Mathematics learning, including student responses, their desire to learn, and the potential for developing more innovative and engaging teaching methodologies.

Discussion

In discussing the necessity of Interactive Project-Based Learning (PjBL) Electronic Worksheets to support deep learning, it is crucial to recognize that both PjBL and interactive e-LKPD function not merely as teaching methodologies but as tools to achieve deeper learning objectives. Project-Based Learning (PjBL) is an approach focused on active student engagement, creating opportunities for students to learn through collaboration and real-world

problem-solving, which potentially enhances their critical thinking and creativity skills (Susiana & Renda, 2021; Sakti et al., 2021).

The creation of interactive e-LKPD that adopts PjBL principles can significantly boost student interaction with the learning content. Research by Tedana et al. (2024) indicates that the use of HOTS-based E-LKPD within the PjBL model improves students' literacy and numeracy skills, demonstrating a positive correlation between interactive learning media and the effectiveness of achieving student competencies. Furthermore, a study by Wahyuni and Rahayu (2021) revealed that the development of PjBL-based e-Books can help students practice creative thinking by tailoring content to their interests, thereby supporting deep learning. Therefore, media that supports active interaction is highly necessary to optimize this learning process.

In addition, the development of interactive e-LKPD requires an in-depth analysis of the essential features needed by both students and educators. Research by Khairat and Suryanto (2025) emphasizes the importance of understanding feature requirements within a Learning Management System (LMS) to support interactive project-based learning. These features should function not only to distribute materials but also to facilitate student collaboration, encourage research, and effectively track student learning progress. This indicates that the successful implementation of interactive e-LKPD heavily relies on a deep understanding of user needs, from both the student and teacher perspectives.

The implementation of PjBL in an interactive context also stimulates deep learning. Noted that e-LKPD designed for project-based learning enhances students' communication and critical thinking skills, which in turn supports the development of science literacy (Fauzizah, 2023; Agusdianita, 2023). Deep learning involves a comprehensive understanding of the topic taught—a vital achievement in today's challenging era of modern education.

In the context of PjBL-based e-LKPD design, the ADDIE model has proven effective as a framework for designing and developing innovative learning materials. Research by Viagung (2025) shows that using the ADDIE model helps ensure that the e-LKPD meets academic standards while being relevant and engaging for students. The structured process within ADDIE, which includes analysis, design, development, implementation, and evaluation, guarantees that the final product is beneficial in the intended learning context.

Thus, the integration of e-LKPD, PjBL, and deep learning creates a complementary synergy. The e-LKPD acts as a tool supporting the active learning approach, while PjBL provides the appropriate context for these activities. The expectation is that students will gain a more profound and applicable learning experience, contributing not only to their individual achievements but also to the overall advancement of education. Ultimately, the success of this implementation significantly depends on the engagement and commitment of all stakeholders educators, students, and education administrators. Coordination and collaboration among all parties are highly anticipated to result in interactive and effective e-LKPD, contributing to the development of increasingly vital and relevant 21st-century competencies.

CONCLUSION

The analysis of student needs, supported by the quantitative results and a review of pedagogical literature, establishes a pressing and clearly defined need for the development of Interactive Project-Based Learning (PjBL) Electronic Student Worksheets (E-LKPD) designed to foster deep learning in Mathematics for 4th-grade students. The data collected from the 25 student respondents at SD Negeri 42 Bengkulu City highlight a significant gap in current instructional practices: while 19 students expressed enjoyment in utilizing LKPD-based learning activities, a majority (15 students) reported that their teachers do not consistently use the tool. Furthermore, the existing LKPD predominantly consists of unvaried problems

sourced only from school textbooks (17 students), which impedes comprehensive learning. Crucially, students demonstrate a high motivation for innovation, with 20 respondents finding existing problems enthusiastic and an equal number enjoying instructional videos on YouTube, confirming their readiness and desire for modern, digital learning content. This readiness signals that an interactive E-LKPD is highly relevant to their learning style.

The integration of PjBL within this digital platform is pedagogically critical, as the discussion confirms PjBL's effectiveness in promoting 21st-century skills such as critical thinking and collaboration, which are essential for achieving deep learning. The E-LKPD must, therefore, be developed with features that not only distribute content but also facilitate active collaboration and problem-solving, aligning with the principles outlined in the ADDIE model for ensuring a robust and user-centric design. In conclusion, the development of the Interactive PjBL E-LKPD is not simply a beneficial resource but a necessary intervention to address the deficit in varied, engaging, and technology-supported learning materials, ultimately transforming passive consumption into active, profound comprehension of Mathematics concepts and better preparing students for future academic challenges.

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