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Developing LKPD based on PBL to improve students' learning outcomes

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ABSTRACT

Teaching materials are one of the important factors that influence the effectiveness of the learning process. This research aims to produce Student Worksheets based on Problem Based Learning that are feasible, practical and effective. The research was carried out at SDN 105278 Tandam Hilir II. Class IV research subjects were 22 students. The research method is development research with the ADDIE development model. The research instruments are observation, interviews, questionnaires and tests. The research results show that from the results of the validity test by the validator, the feasibility percentage for material experts was 90.66 percent, the criteria were very valid, the linguist's feasibility percentage was 93.33 percent, which was considered very valid, the design expert produced a validity level of 100 percent, the criteria were very valid. The results of the small group trial produced a very practical criteria percentage of 90.48 percent. The practicality percentage of field test results of 91.56 percent is a very practical criterion. Effectiveness was achieved at the field trial stage with 22 students (100 percent) passing the post-test; a gain score of 0.6931 meets the criteria for moderate effectiveness. Based on empirical observations which show an increase in learning outcomes. This means that Student Worksheets based on Problem Based Learning are effectively used in the mathematics learning process so that they have an impact on student learning outcomes in class IV at SDN 105278 Tandam Hilir II.

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ABSTRAK

Bahan ajar merupakan salah satu faktor penting yang mempengaruhi efektivitas proses pembelajaran. Penelitian ini bertujuan untuk menghasilkan Lembar Kerja Peserta Didik berbasis pembelajaran Problem Based Learning yang layak, praktis dan efektif. Penelitian dilaksanakan di SDN 105278 Tandam Hilir II. Subjek penelitian kelas IV berjumlah 22 orang siswa. Metode penelitian adalah penelitian pengembangan dengan model pengembangan ADDIE. Adapun Instrumen penelitian yaitu observasi, wawancara, angket dan tes. Hasil penelitian menunjukkan dari hasil uji validitas oleh validator persentase kelayakan ahli materi sebesar 90,66 persen kriteria sangat valid, ahli bahasa persentase kelayakan sebesar 93,33 persen dinilai sangat valid, ahli desain menghasilkan tingkat validitas 100 persen kriteria sangat valid. Hasil uji coba kelompok kecil menghasilkan persentase kriteria sangat praktis sebesar 90,48 persen. Persentase kepraktisan hasil uji lapangan sebesar 91,56 persen merupakan kriteria sangat praktis. Efektivitas dicapai pada tahap uji coba lapangan dengan 22 peserta didik (100 persen) lulus post-test; skor gain sebesar 0,6931 memenuhi kriteria efektivitas sedang. Berdasarkan observasi empiris yang menunjukkan adanya peningkatan hasil belajar. Artinya Lembar Kerja Peserta Didik berbasis pembelajaran Problem Based Learning efektif digunakan dalam proses pembelajaran matematika sehingga berdampak pada hasil belajar siswa di kelas IV SDN 105278 Tandam Hilir II.

Kata Kunci: *kata kunci satu; kata kunci dua; kata kunci tiga; kata kunci empat*

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INTRODUCTION

Nationally, learning is viewed as an interactive process involving key components, students, educators, and learning resources within a learning environment. Thus, the learning process is a system consisting of interrelated and interacting components working together to achieve the desired outcomes optimally, per the predetermined goals. One of the subjects currently implemented is mathematics. Mathematics learning serves as the foundation of all sciences. It is widely recognized that mathematics is a fundamental discipline used to understand other fields of study (Febrianingsih, 2022), so all children should master mathematics (Larosa et al., 2024). Mathematics is an exact and structured branch of knowledge taught in progressive stages that aligns with each student's cognitive ability (Muthma'innah, 2023). It is the science of quantity, measurement, and spatial relationships. In practice, mathematics deals with abstract ideas, logical structures, and their interconnections, all organized systematically (Umbara et al., 2023). Mathematics is a deductive discipline that does not accept generalizations based on observation (induction) but those proven through deductive reasoning.

Based on the results of the observations, the researcher identified several clear conditions in the field. It was found that teachers generally used conventional teaching methods, occasionally interspersed with group discussions. However, the learning process showed a lack of utilization of teaching materials, primarily due to limited preparation time and the complexity involved in developing the materials. The available teaching materials in schools have not been validated by experts, making it unclear whether they are suitable for use. Product validation is essential to identify developed materials' weaknesses and produce high-quality educational resources (Nurofik et al., 2022; Wahyuni, 2022). There are various ways to address these weaknesses, including improving teaching strategies, enhancing the readiness of learning tools, developing quality teaching materials, and ensuring the cognitive preparedness of teachers, among others. In this research, the researcher focuses on teaching materials (Fatih & Alfi, 2023; Gala et al., 2021). Teaching materials are a key supporting component in the learning process, as they help guide systematic procedures, structure activities, and foster student independence (Meidita & Susilowibowo, 2021).

Previous reviews have not yielded satisfactory outcomes in achieving learning objectives during the learning process. Many educators fail to utilize available media and learning facilities that could enhance the effectiveness of instruction. Developing teaching materials remains complex and challenging, often due to limited preparation time (Khaira et al., 2023). Earlier research has indicated that teachers still rely on conventional learning models and possess limited capacity to manage instructional media to support classroom activities (Rahayu et al., 2019; Rosyiddin et al., 2023). Moreover, teachers lack a comprehensive understanding of learning models and approaches relevant to the subject matter, resulting in suboptimal application of knowledge and difficulties for students in following the intended learning trajectory (Chew & Cerbin, 2021). Other research also shows that educators face challenges integrating technology into the educational environment (Ma'wa & Gunansyah, 2024). As a result, the learning process becomes conventional, and there is a lack of student involvement in it.

Teaching materials are essential in ensuring the effectiveness of teaching and learning activities, including Lembar Kerja Peserta Didik. LKPD is an instructional material designed to help students understand the subject matter more easily and support learning (Novriani et al., 2021; Umardianti et al., 2021). LKPD typically includes practical instructions, experiments, discussion prompts, portfolio tasks, and practice questions. These components enhance student engagement throughout the learning process. LKPD is commonly used by teachers in the classroom as both a learning medium and a resource. It provides structured guidance or instructional content that students can use independently to improve their understanding, knowledge, skills, and attitudes (Husna et al., 2022).

LKPD (Lembar Kerja Peserta Didik) is a set of sheets containing tasks students must complete. These activity sheets typically include instructions or step-by-step guidance to complete a task, and the tasks

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should align with the basic competencies to be achieved (Septian et al., 2019). The LKPD is helpful as a teaching material that encourages active student participation and reduces the teacher's role as the sole source of knowledge (Khoiriah & Suryani, 2023). LKPD is one of the instructional materials that students find easy to use (Herlina et al., 2021). LKPD often includes practicum activities, experiments, discussion materials, portfolio tasks, and practice questions (Swiyadnya et al., 2021). Learning models in the twenty-first century must be innovative, learner-centered, and grounded in science and technology. One learning strategy that aligns with the demands of the twenty-first century and follows the principles of the empirical approach is problem-based learning. This model encourages students to solve real-life problems, promotes active engagement in the learning process, and fosters continuous motivation for lifelong learning (Widiarti et al., 2021).

The PBL model enhances students' understanding of subject matter by utilizing real-world situations or problems. This approach fosters critical thinking, problem-solving abilities, teamwork, and the practical application of knowledge (Widiastuti et al., 2023). It also encourages students to actively seek information, develop independent learning skills, and strengthen their communication abilities (Puangpunsi, 2021). PBL is an inquiry-driven, student-centered instructional method that facilitates the development of problem-solving competencies (Rafiq et al., 2023). The PBL model is grounded in social constructivist theory, which emphasizes constructing diverse knowledge perspectives through multiple representations and social interactions. This model focuses on collaborative discovery, authentic learning experiences, and real-world assessments (Mishra, 2023). PBL is a learning strategy that is driven by problems. The problems in PBL can take the form of challenges, descriptions of difficulties, results that are difficult to understand, or unexpected events that contain interesting elements requiring a solution or explanation (Thomassen & Jørgensen, 2021).

This research aimed to develop Lembar Kerja Peserta Didik (LKPD) based on Problem-Based Learning (PBL) or mathematics learning and analyze its effectiveness in improving student learning outcomes. Specifically, it aims to identify the characteristics of LKPD based on PBL that align with mathematics education needs and develop valid, practical, and effective LKPD.

LITERATURE REVIEW

Problem-Based Learning

Problem-based learning involves examining real-world problems that demand pragmatic solutions (Karina & Yani, 2020; Langitasari et al., 2021). Problem-Based Learning (PBL) is a contextual supplementary learning strategy that utilizes students to develop critical thinking and problem-solving skills while acquiring the basics and concepts of the subject matter (Larosa et al., 2024). Problem-based learning deviates from using cases and problems to achieve learning goals (Sari et al., 2021). PBL syntax, namely: 1) Student orientation to problems is one of the components of the problem-based learning model; 2) Students are organized around problems; 3) Individual or group experiences are guided; 4) The results of the work are developed and presented; and 5) The problem-solving process is analyzed and evaluated (Larosa et al., 2024; Langitasari et al., 2021).

Learning Outcomes

A person's learning behavior, usually manifested through changes, routines, skills, attitudes, and abilities, can be interpreted as learning outcomes. Every educational endeavor carries expectations or goals to be achieved by both teachers and students. After completing the learning experience, students are expected to demonstrate change, progress, and uniqueness. These differences may manifest in talent, wisdom, or attitude. As described in Bloom's taxonomy, learning outcomes can be classified into three overarching domains: cognitive, affective, and psychomotor (Magdalena et al., 2020). Dimyati and Mudjiono, in their book *"Belajar dan Pembelajaran*," define learning outcomes as numerical results or grades obtained from

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assessments conducted at the end of each subject. These outcomes are measured using indicators from the cognitive domain of Bloom's taxonomy, which consists of six subdomains ranked by complexity: memory (C1), comprehension (C2), analysis (C4), and evaluation (Magdalena et al., 2020).

Several factors influence student learning outcomes, including (1) the teaching methods employed by teachers, (2) students' backgrounds, (3) the school environment, (4) the learning evaluation model, and (5) internal and external factors considered by students when applying learning strategies (Ismawati, 2020). Learning achievement tests can be utilized to assess and monitor student learning outcomes. Depending on their purpose and scope, these tests are generally classified into formative and summative assessments (Nurfaridah et al., 2019).

Lembar Kerja Peserta Didik (LKPD)

LKPD is a learning resource that contains subject matter, task sheets, and other supporting components such as titles, CP, and indicators, which serve as supporting media to assist and facilitate the process of delivering learning materials from teacher to student (Khoiriah & Suryani, 2023). According to Putri in Anita et al. (2022), Lembar Kerja Peserta Didik (LKPD) is a printed teaching material with guidelines students can use to develop their abilities. Larosa et al. (2024) define LKPD as a learning tool, either as a learning medium or resource, that contains guidance or teaching materials that students can use independently to improve their understanding, skills, and attitudes. (Larosa et al., 2024). According to Kristyowati in *"Lembar Kerja Peserta Didik (LKPD) IPA Sekolah Dasar Berorientasi Lingkungan*," there are several forms of LKPD, namely:

a) LKPD helps students discover concepts. This type of LKPD contains instructions on what students must do.
b) LKPD assists students in applying and integrating various concepts they have found.
c) LKPD that functions as a learning guide.
d) LKPD that serves as practicum instructions.

For LKPD development research conducted by prospective researchers, the form of LKPD to be developed is the one that helps students apply and iterate various concepts that have been discovered.

METHODS

The method used in this research is research and development. Research and development can be defined as a scientific approach to investigating, designing, producing, and testing the validity of a developed product. Furthermore, research generally aims to describe, verify, develop, discover, and create. The primary objectives of the research are to validate, reveal, and explain. This research's subjects were 22 students enrolled in Grade IV at SDN 105278 Tandam Hilir II. The object of this research is the LKPD based on Problem-Based Learning on integers.

This research employed a development model using the ADDIE framework proposed by Robert Maribe Branch, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. Product trials were conducted to evaluate the feasibility, usability, and effectiveness of the developed LKPD. The evaluation phase involved assessments by subject matter experts, language experts, and design experts to review the LKPD. The practicality of the LKPD was assessed through student response questionnaires. The effectiveness of the LKPD was evaluated through tests, the results of which are presented in **Tables 1– 4.**

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Expert Validation Questionnaire

Table 1. Expert Material Assessment Instrument

No	Criteria	Indicators	Items Number	Number of Items
1	Feasibility of content and material	A. Relevance of the material to basic competencies	1, 2, & 3	3
		B. Accuracy of the material	4,5,6,7, & 8	5
		C. Currency of the material	9 &10	2
		D. Encouraging curiosity	11 &12	2
2	Feasibility of presentation	A. LKPD structuring	13	1
		B. Learning presentation	14 & 15	2

Source: Research, 2023

Table 2. Expert Media Assessment Instrument

No	Criteria	Indicators	Items Number	Number of Items
1	Media feasibility	A. Cover design	1, 2, & 3	3
		B. Layout design	4 & 5	2
		C. Accuracy in the use of text, images, and illustrations	6, 7, 8, 9, & 10	5
		D. Suitability with students' developmental level	6 & 7	2
		E. Appropriateness with linguistic rules	8 & 9	2

Source: Ministry of National Education in "Panduan Pengembangan Bahan Ajar"

Table 3. Language Expert Assessment Instrument

Criteria	Indicators	Items Number	Number of Items
Language feasibility	F. Clarity	1, 2, & 3	3
	G. Communicative	4	1
	H. Dialogic and interactive	5	1
	I. I.Appropriateness with learners' developmental level	6&7	2
	J. Conformity with linguistic rules	8&9	2

Source: Ministry of National Education in "Panduan Pengembangan Bahan Ajar"

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Table 4. Student Response Instrument

No	Aspect	Indicators	Number of Items
1	Physical Appearance	1. The LKPD cover design is attractive 2. The font style is comfortable and straightforward to read 3. The color combination used is appealing 4. The images presented are relevant to the material discussed	4
2	Content	5. The material is easy to understand 6. The language used is simple and easy to comprehend 7. The sentences used are easy to understand 8. Instructions are conveyed 9. The problems presented are easy to understand and solve 10. The steps in the LKPD are easy to follow 11. Practice questions match the material discussed	7
3	Usability	12. Helps in learning integer concepts more easily 13. Easy to use for both independent and group learning 14. Motivates me to learn integer concepts	3

Source: Research, 2024

Data Analysis Techniques

Analysis of Product Validity and Practicality Data

The methodology used to analyze this study's descriptive, quantitative, and qualitative data includes the feasibility and practicality of the developed learning video product. The data analyzed related to the feasibility and practicality of the product are shown in **Tables 5 and 6.**

Table 5. Kriteria Validitas LKPD berbasis PBL

Validity Level	Validity Criteria
$85{,}01\% - 100{,}00\%$	Very valid; no revision needed.
$70{,}01\% - 85{,}00\%$	Valid and can be used, but requires minor revisions.
$50{,}01\% - 70{,}00\%$	Less valid and not recommended for use as it requires major revisions.
$01{,}00\% - 50{,}00\%$	Not valid; not suitable for use.

Source: Rachmi et al. (2023)

Analysis of Learning Outcome Effectiveness

$$Student\ achievement\ scor = \frac{total\ student\ score}{ideal\ total\ test\ score} \times 100\%$$

The proportion of classical mastery is determined by applying the following formula:

$$P = \frac{T}{n} \times 100\%$$ (Gitriani et al., 2018)

Where,

P = Percentage of classical mastery achievement

T = Total number of students who passed

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n = Total number of students

Table 8 shows the various categories of classic completeness percentages.

Table 6. Classical Mastery Level Categories

Interval (%)	Category
$P > 80$	Highly Commendable
$70 < P \leq 80$	Commendable
$60 < P \leq 70$	Sufficient
$50 < P \leq 60$	Insufficient
$P \leq 50$	Highly Insufficient

Source: Devi & Subali (2021)

The normalized gain formula developed by Hake is used to calculate the gain before and after the learning process (Hake, 1998):

$$Normalized\ Gain\ (g) = \frac{post\ test\ score - \ pre\ test\ score}{100 - \ pre\ test\ score}$$

The PBL-based LKPD is considered practical in terms of effectiveness when the gain interpretation falls into moderate or high categories.

RESULTS AND DISCUSSION

The findings of this development research focus on two main aspects: describing the procedures involved in developing PBL-based LKPD teaching materials and demonstrating the credibility and effectiveness of the resulting LKPD. The development procedure for PBL-based LKPD consists of the following five phases:

1) Analysis phase. This stage evaluates student characteristics, teacher needs, and curriculum analysis. Data were collected through interviews and observations.
2) Design phase. At this stage, the design of the teaching material is selected and determined. The Canva software program was used to support the development of the PBL-based LKPD. Examples of the LKPD design outcomes can be seen in **Figures 1–4**

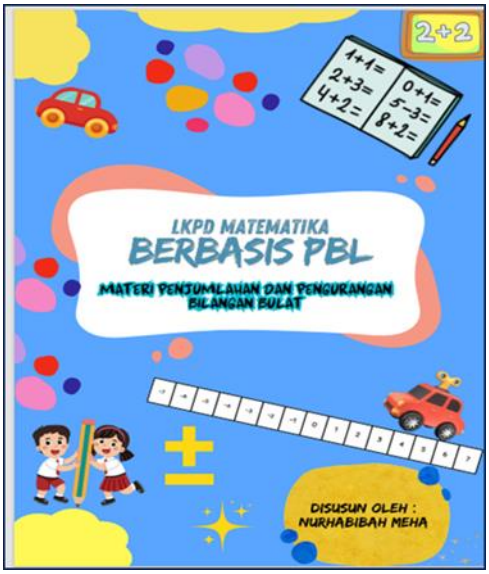

Figure 1. LKPD Cover Design

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Source: Author's Documentation, 2023

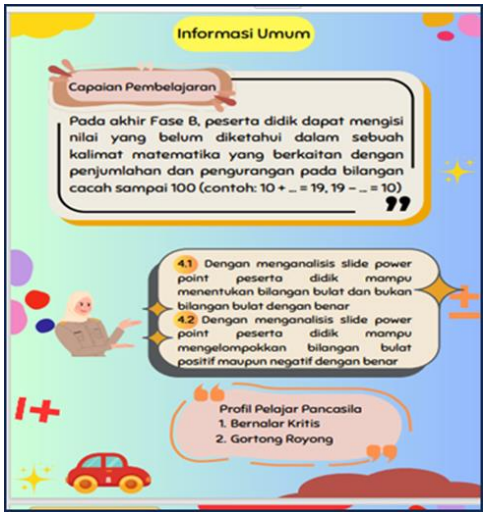

Figure 2. Presentation of General Information Related to the Learning Objectives
Source: Author's Documentation, 2023

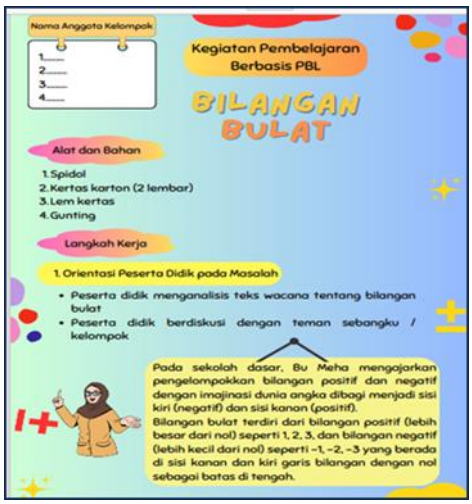

Figure 3. Presentation of Learning Materials in the LKPD
Source: Author's Documentation, 2023

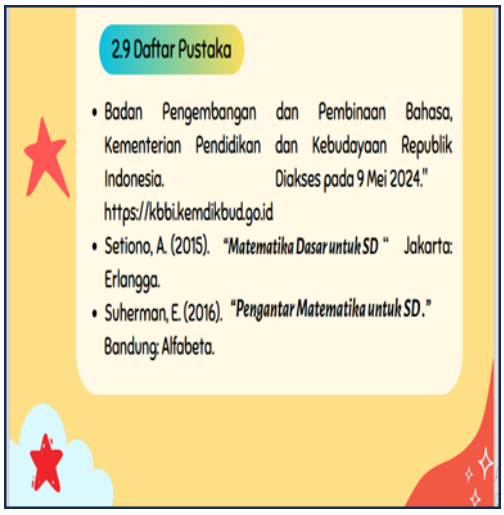

Figure 4. Bibliography Page
Source: Author's Documentation, 2023

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3) Product Development Stage. The LKPD product was developed according to the initial instructional design plan. Experts assessed its appropriateness through a validity test covering material, design, and language aspects. The results of the expert validation are presented in **Table 7**.

Table 7. Product Validity Results by Experts

No.	Trial Subject	Validity Result	Description
1	Material Expert Validation	90,66%	Very Valid
2	Design Expert Validation	100%	Very Valid
3	Language Expert Validation	93,33%	Very Valid

Source: Research, 2024

4) Implementation Phase. The trial was conducted with 22 field students, nine of whom were randomly selected for a small group setting. It aimed to measure how well students understood, followed, and felt motivated by the treatment using PBL-based LKPD teaching materials. The findings from the student response questionnaire are presented in **Table 8.**

Table 8. Student Response Results

No.	Trial Subject	Response Result	Description
1	Small Group Test	90,48%	Very Practical
2	Field Test	91,56%	Very Practical

Source: Research, 2023

5) Evaluation Phase. This phase assessed the effectiveness of PBL-based LKPD teaching materials in enhancing academic achievement and fostering innovation among fourth-grade students at SDN 105278 Tandam Hilir II. The data presented in Table 9 discuss the improvement in learning outcomes.

Table 9. Item Validity

Number of Items	r_{xy}	Correlation Level	Description
1	0,741	Strong	Valid
2	0,540	Fairly Strong	Valid
3	0,564	Fairly Strong	Valid
4	0,609	Strong	Valid
5	0,537	Fairly Strong	Valid
6	0,464	Fairly Strong	Valid
7	0,561	Fairly Strong	Valid
8	0,470	Fairly Strong	Valid
9	0,564	Fairly Strong	Valid
10	0,503	Fairly Strong	Valid
11	0,470	Fairly Strong	Valid

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12	0,515	Fairly Strong	Valid
13	0,464	Fairly Strong	Valid
14	0,537	Fairly Strong	Valid
15	0,464	Fairly Strong	Valid

Source: Research, 2023

Based on the pretest and post-test results, the interval of student achievement was determined the interval of student achievement based on the cumulative data. This can be seen in **Table 10.**

Table 10. Frequency Interval of Pretest Data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	46-50	3	13.6	13.6	13.6
	51-55	4	18.2	18.2	31.8
	56-60	5	22.7	22.7	54.5
	61-65	5	22.7	22.7	77.3
	66-70	2	9.1	9.1	86.4
	71-75	2	9.1	9.1	95.5
	76-80	1	4.5	4.5	100.0
	Total	22	100.0	100.0	

Source: Research, 2023

Based on **Table 10**, it is explained that Most students get scores in the intervals of 56-60 and 61-65, with a frequency of 5 or 22.7%, respectively. Few students get grades in the 76-80 interval, with a 1 or 4.5% frequency. The cumulative Percentage shows that 77.3% of students get a score up to 65, and 100% get a score up to 80. Based on this table, we can see the distribution of pretest values and know which intervals have the most frequency and which have the least.

Table 11. Frequency Interval of Posttest Data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	71-75	2	9.1	9.1	9.1
	76-80	2	9.1	9.1	18.2
	81-85	7	31.8	31.8	50.0
	86-90	6	27.3	27.3	77.3
	91-95	3	13.6	13.6	90.9
	96-100	2	9.1	9.1	100.0
	Total	22	100.0	100.0	

Source: Research, 2023

Based on **Table 11,** it can be interpreted that:

a) Most post-test values are in the interval of 81-85, with a frequency of 7 or 31.8%.

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b) The interval with the second largest frequency was 86-90, with six observations or 27.3%.
c) Higher values, such as 91-95 and 96-100, have a lower frequency of 3 and 2 observations, translating to a total percentage of 13.6% and 9.1%.
d) A cumulative percentage indicates that 50% of the post-test value is below or equal to 85, and 100% is below or equal to 100

Table 12. Pre-test and Post-test Score Results

Score Range	Category	Pre-test		Post-test	
		Frequency	Percentage	Frequency	Percentage
$75-100$	Achieved	1	5%	22	100%
$0-74$	Not achieved	21	95%	-	-

Source: Research, 2023

Interpretation of Pretest Data:
a) Only one student (5%) achieved a Completion score (75-100).
b) Most students, namely 21 (95%), were in the Incomplete category (0-74).
Meanwhile, in the post-test interpretation, all students (22 students, 100%) achieved a complete score (75-100). This means that student learning outcomes after implementing the teaching materials improved students' learning abilities.

Changes in student learning after using additional teaching materials in the form of PBL-based LKPD show significant changes in teaching methods, learning design, learning processes, student activeness, and results. This causes all students to achieve a complete score on the post-test. Furthermore, to see an increase in learning outcomes, NGain can be calculated and assisted by the SPSS 25 application. Table 13 analyzes the influence of the main calculation on the academic achievement of grade IV students of SDN 105278 Tandam Hilir II.

Table 13. Calculation Results of Students' Learning N-Gain

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	25	.10	.95	.6931	.22223
Valid N (listwise)	25				

Source: Research, 2023

Table 13 explains that NGain data shows that all students experience increased scores between the pretest and post-test. The average increase (0.6931) in the medium category is in line with previous research, which illustrates the credibility of the success of using teaching materials in the form of LKPD based on the PBL model as a whole. (Larosa et al., 2023; Husna et al., 2022).

Discussion

Using the developed PBL-based LKPD can help improve students' learning outcomes. This aligns with previous studies showing that PBL-based LKPD activates students' problem-solving abilities and contributes to positive learning achievements (Ma'wa et al., 2021; Swiyadnya et al., 2021). The developed LKPD also supports the role of teachers in the learning process by reducing their dominance in lecturing and allowing them to act more as facilitators. Relevant studies to this research highlight that LKPD is effective in learning activities, enhancing students' creative thinking skills, which positively affect their learning outcomes (Wahyuni et al., 2024; Nisa & Fatmahanik, 2023; Azizah et al., 2022). Moreover, PBL-based LKPD has effectively facilitated students' mathematical literacy skills (Khotimah & Aini, 2022).

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Using the developed PBL-based LKPD contributes to improving student learning outcomes and supports the implementation of more innovative and interactive learning approaches. Involving students in real-world problem-solving, the LKPD encourages them to engage more actively in critical thinking, collaboration, and constructing their understanding of mathematical concepts (Fathin et al., 2023). Evaluation in the learning process is an essential aspect of ensuring the effectiveness of PBL-based LKPD, where teachers are facilitators who provide constructive feedback and help students reflect on their understanding (Muis & Dewi, 2021). The implementation of the PBL-based LKPD demonstrated potential to improve learning outcomes. It helps shape a mindset in students that is more independent, reflective, and adaptive when facing learning challenges.

PBL-based LKPD also increases students' motivation to learn as they become more actively involved in the learning process and feel they have control over their learning. Previous research has shown that the PBL method effectively enhances students' curiosity, engagement, and confidence in completing academic tasks (Becerra-Posada et al., 2022). When LKPD is systematically designed, students can more easily understand the steps in solving math problems gradually, thus reducing their anxiety toward the subject (Maharani & Waluya, 2024). Therefore, implementing PBL-based LKPD impacts student learning outcomes and positively contributes to teachers' teaching strategies and the overall effectiveness of the learning process.

CONCLUSION

The following conclusions can be drawn based on the research and development results: (1) The feasibility of the Problem-Based Learning (PBL) based LKPD developed, evaluated by material, design, and language experts, was rated as highly feasible. Therefore, the product is deemed highly suitable for use in mathematics instruction for fourth-grade students at SDN 105278 Tandam Hilir II on the topic of integers; (2) The practicality of the PBL-based LKPD on the topic of integers for fourth-grade students at SDN 105278 Tandam Hilir II was assessed through student responses. The small-group and field trials demonstrated that the LKPD is highly practical; (3) The learning video integrated with the PBL effectiveness on fraction topics was rated as very good, showing a moderate improvement in students' average learning outcomes. The learning activities using the PBL-based LKPD are aligned with cognitive learning theory, where students independently explore and discover solutions to problems. Moreover, students actively participate in the learning process, critically think, construct concepts, and assign meaning to their learning. These outcomes align with this development's objective: to produce an effective PBL-based LKPD for classroom instruction.

AUTHOR'S NOTE

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