



The Effectiveness of Using Student Worksheets to Enhance Learning Independence and Creativity

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Articles Information

Abstrak

Keywords:

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Penelitian ini bertujuan untuk menganalisis efektivitas penggunaan Lembar Kerja Peserta Didik (LKPD) dalam meningkatkan kemandirian belajar dan kreativitas peserta didik kelas V pada pembelajaran matematika di Sekolah Dasar Negeri 33 Pontianak Barat. Penelitian ini menggunakan pendekatan kuantitatif dengan desain pre-experimental one-group pretest-posttest. Sampel penelitian terdiri atas 28 peserta didik kelas V-B. Data dikumpulkan melalui angket kemandirian belajar, lembar observasi kreativitas, dan tes hasil belajar. Hasil uji normalitas menunjukkan bahwa seluruh data berdistribusi normal ($p > 0,05$). Uji hipotesis menggunakan Paired Samples t-test menunjukkan nilai signifikansi (2-tailed) sebesar 0,000 ($p < 0,05$) untuk kemandirian belajar, kreativitas, dan hasil belajar, yang berarti peningkatan yang terjadi signifikan secara statistik dan tidak terjadi secara kebetulan. Effect size untuk kemandirian belajar sebesar 1,788 dan untuk kreativitas sebesar 1,802, keduanya termasuk dalam kategori tinggi. Nilai effect size yang tinggi ini menunjukkan bahwa penggunaan LKPD memberikan dampak yang besar dan bermakna terhadap perilaku belajar peserta didik, terutama dalam meningkatkan kemampuan belajar mandiri, berpikir kreatif, serta keterlibatan aktif selama proses pembelajaran. Berdasarkan hasil tersebut, LKPD terbukti efektif dalam meningkatkan kemandirian belajar dan kreativitas peserta didik pada pembelajaran matematika materi keliling bangun datar. Secara praktis, pendidik dapat menerapkan strategi pembelajaran berbasis LKPD untuk mendorong pembelajaran mandiri dan berpusat pada peserta didik di berbagai mata pelajaran, sehingga peserta didik dapat lebih bertanggung jawab terhadap proses belajarnya serta mampu mengembangkan keterampilan berpikir kreatif dalam memecahkan masalah.

Abstact

This study aims to analyze the effectiveness of using Student Worksheets (LKPD) in improving the learning independence and creativity of fifth-grade students in mathematics learning at State Elementary School 33 Pontianak Barat. This study employs a quantitative approach with a pre-experimental one-group pretest-posttest design. The research sample consisted of 28 fifth-grade students from class V-B. Data were collected through a learning independence questionnaire, creativity observation sheets, and learning achievement tests. The results of the normality test showed that all data were normally distributed ($p > 0.05$). Hypothesis testing using the Paired Samples t-test revealed a significance value (2-tailed) of 0.000 ($p < 0.05$) for learning independence, creativity, and learning outcomes, indicating that the improvement was statistically significant and not due to chance. The effect size for learning independence was 1.788 and for creativity was 1.802, both categorized as high. These high effect sizes suggest that the use of LKPD had

a substantial and meaningful impact on students' learning behavior, enhancing their ability to work independently, think creatively, and engage actively during lessons. Based on these findings, the use of LKPD is proven to be effective in improving students' learning independence and creativity in mathematics learning, particularly on the topic of the perimeter of flat shapes. In practical terms, educators can implement LKPD-based learning strategies to promote self-directed and student-centered learning in various subjects, encouraging students to take greater responsibility for their learning while developing creative problem-solving skills.

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INTRODUCTION

Education serves as a fundamental pillar in developing an advanced nation, as stated in Law No. 20 of 2003 concerning the National Education System. The law emphasizes that education aims to develop students' potential comprehensively, covering spiritual, intellectual, moral, and skill-based aspects that are relevant to societal and national needs. The success of education is reflected in observable changes in students' behavior—physically, mentally, and emotionally—throughout the learning process (Prastowo, 2014).

In the era of globalization, independent learning and creativity have become essential competencies for students. Independent learning enables learners to take the initiative, act responsibly, and complete academic tasks without relying on others (Aulia, Susilo, & Subali, 2019). Meanwhile, creativity encourages students to think divergently, produce original ideas, and develop innovative solutions to problems (Asrori, 2015). Both of these skills are crucial in mathematics education, where students are expected not only to understand concepts but also to apply them creatively in solving real-world problems.

However, based on preliminary interviews with teachers at State Elementary School 33 West Pontianak, the existing student worksheets (LKPD) mainly contain basic elements—such as titles, student identity, and practice questions—without adequate components that promote higher-order thinking, self-regulation, or creative exploration. This limitation prevents students from fully developing independence and creativity during the learning process.

Student Worksheets (Lembar Kerja Peserta Didik or LKPD) are designed to facilitate active, independent, and creative learning (Trianto, 2010). An effective LKPD should include eight components: title, basic competencies, learning instructions, supporting information, tasks, assessments, completion time, and reporting activities (Prastowo, 2014). When these components are integrated properly, LKPD can serve not only as a learning aid but also as a pedagogical tool that fosters autonomy, engagement, and innovation among students.

Therefore, this study aims to examine the effectiveness of using LKPD in enhancing fifth-grade students' learning independence and creativity in mathematics lessons on the topic of the perimeter of two-dimensional shapes. This research is expected to provide empirical evidence of how well-designed student

worksheets can contribute to improving students' self-directed learning and creative thinking abilities in the classroom.

METHOD

This study employed a pre-experimental one-group pretest-posttest design, which was selected to measure the changes in students' learning independence, creativity, and learning outcomes before and after the implementation of LKPD. In this design, one group of participants was administered a pretest to establish baseline performance, received a treatment using LKPD-based instruction, and was subsequently given a posttest to identify any significant improvement (Arikunto, 2013). This design was considered appropriate for this study because it allows for the direct comparison of student performance within the same group, thereby highlighting the effectiveness of the learning intervention.

The research population comprised all fifth-grade students at State Elementary School 33 West Pontianak, consisting of two learning groups. The research sample was class V-B, which included 28 students. The class was chosen using purposive sampling, considering not only class availability and teacher willingness but also the class's stable attendance rate, cooperative learning environment, and alignment with the curriculum implementation plan. These factors ensured that the sample provided reliable data representative of the school's learning conditions.

The independent variable in this study was the use of Student Worksheets (LKPD), while the dependent variables were students' learning independence and creativity. Theoretically, the independent variable was expected to influence the dependent variables by providing structured opportunities for students to engage in self-directed tasks, problem-solving, and collaborative discussions that stimulate both independence and creativity.

Learning independence was measured using a questionnaire consisting of 20 statements adapted from Barokah Widuroyeki (2022), covering five indicators: freedom, progressiveness, initiative, internal control, and self-confidence. Creativity was assessed using an observation sheet developed from Marlioni (2015), with four indicators: flexibility, originality, elaboration, and fluency. Meanwhile, learning achievement was evaluated through a mathematics test focusing on the topic of the perimeter of two-dimensional shapes. All instruments were validated by two experts in education and were tested for reliability using Cronbach's Alpha, yielding coefficients above 0.80, indicating high reliability.

Data analysis involved both descriptive and inferential statistics. The Kolmogorov–Smirnov test was used to verify the normality of the data ($p > 0.05$), confirming that the distribution met the assumption of normality. The Paired-Samples t-test was then applied to compare pretest and posttest results. The significance level was set at 0.05, with the criterion that if $p < 0.05$, the null hypothesis would be rejected, and the alternative hypothesis (H_a) would be accepted. The magnitude of the treatment effect was calculated using Cohen's d , with interpretations based on conventional thresholds: small (0.2), moderate

(0.5), and large (≥ 0.8). In the context of this study, a large effect size indicates a substantial and meaningful improvement in students' independence and creativity resulting from the LKPD implementation.

RESULT AND DISCUSSION

Based on the data obtained, it can be concluded that there was a significant improvement in students' learning independence and creativity after the implementation of Student Worksheets (LKPD). The findings indicate that LKPD-based learning successfully encouraged students to take initiative, complete tasks responsibly, and express creative ideas in mathematics learning.

The results revealed a notable increase in posttest scores following the LKPD intervention. Table 1 presents the distribution of student learning independence scores after the learning process. The table shows that the overall learning independence reached 85.2%, which falls within the "very high" category. Among the five indicators assessed, initiative achieved the highest score (93.0%), followed by self-confidence (86.6%) and progressiveness (81.5%). These results demonstrate that LKPD provided students with opportunities to plan, act, and reflect independently during classroom activities, supporting the development of responsibility and self-regulated learning.

Table 1. Distribution of Student Learning Independence Data

Indicator Variable	Overall Score	Actual Score	Percentage	Category
Independent learning	2.800	2.328	85,2 %	Very High
1. Freedom	560	458	81,8 %	Very High
2. Progresiveness	560	451	81,5 %	Very High
3. Initiative	560	521	93,0 %	Very High
4. Self-control	560	470	83,9 %	Very High
5. Self confidence	560	485	86,6 %	Very High

Based on the table above, the actual score for student independence after using the Student Worksheet (LKPD) was 2,385 out of a total score of 2,800. Thus, the percentage of student independence in Class V A of Pontianak Barat State Elementary School 33 was 85.2%, which is categorized as very high because it is in the range of 81%-100%. This indicates that after using the Student Worksheet (LKPD), the students' learning independence is very high. This "very high" category demonstrates that the intervention had a consistent and positive impact on all aspects of independent learning, especially initiative, which reached 93%. Such a result reflects students' growing ability to manage tasks autonomously, aligning with Knowles' (in Mentz, 2021) theory of self-directed learning.

The research results also show an increase in observation scores after implementing learning using the Student Worksheet (LKPD). The following is a table of the distribution of student creativity observation

data at the end of learning in the classroom in Table 2. This table complements Table 1 by showing how LKPD influences not only independence but also creativity, a key 21st-century learning skill.

Table 2. Distribution of Student Creativity Observation Data

Indicator Variable	Overall Score	Actual Score	Percentage	Category
Creativity	1.680	1.406	83,7 %	Very High
1. Fluency	420	349	83,1 %	Very High
2. Flexibility	420	358	85,2 %	Very High
3. Authenticity	420	343	81,7 %	Very High
4. Details	420	356	84,8 %	Very High

Based on the table above, the creativity of students after using the Student Worksheet (LKPD) had an actual score of 1,406 with an overall score of 1,680. Thus, the percentage of learning independence of students in Class V A of State Elementary School 33 Pontianak Barat was 83.7%, which is categorized as very high because it is in the range of 81%-100%. This indicates that after using the Student Worksheet (LKPD), the students' creativity is very high. The data imply that LKPD successfully stimulated divergent thinking, helping students become more flexible and original in generating ideas.

The results of the normality test for pretest learning independence of students before and after being given treatment using the Student Worksheet (LKPD) are shown in Table 3 and Table 4. The inclusion of this normality test ensures that the data met statistical assumptions prior to hypothesis testing, thus validating the use of the Paired Samples t-test in subsequent analyses. Normality Test for Pretest Learning Independence of Students.

Tests of Normality

Kolmogorov-Smirnov^a

	Statistic	df	Sig.
pretest	.156	28	.078

a. Lilliefors Significance Correction

From the Kolmogorov-Smirnov Normality Test Table: statistic = 0.156, df = 28, sig = 0.078 (meaning that the data processing results are significant at a probability of $p = 0.078 = 7.8\%$). Based on the data, p in the Normality Test Table $> \alpha = 5\% = 0.05$, so the pretest data on student learning independence is normally distributed.

Normality Test of Posttest Learning Independence

Tests of Normality

Kolmogorov-Smirnov ^a			
	Statistic	df	Sig.
posttest	.129	28	.200*

*. This is a lower bound of the true significance.

From the Kolmogorov-Smirnov Normality Test Table: statistic = 0.129, df = 28, sig = 0.200 (meaning that the data processing results are significant at a probability of $p = 0.200 = 20\%$). Based on the data, p in the Normality Test Table $> \alpha = 5\% = 0.05$, so the posttest data on student learning independence is normally distributed.

The results of the normality test of student creativity pretests before treatment using the Student Worksheet (LKPD) are shown in Tables 5 and 6.

Results of the Normality Test of Student Creativity Pretests Tests of Normality

Tests of Normality

Kolmogorov-Smirnov ^a			
	Statistic	df	Sig.
pertemuan1	.145	28	.137

a. Lilliefors Significance Correction

From the Kolmogorov-Smirnov Normality Test Table: statistic = 0.145, df = 28, sig = 0.137 (meaning that the data processing results are significant at a probability of $p = 0.137 = 13.7\%$). Based on the data, p in the Normality Test Table $> \alpha = 5\% = 0.05$, so the pretest data on student creativity is normally distributed.

Results of the Normality Test for Posttest Creativity of Students

Tests of Normality

Kolmogorov-Smirnov^a

	Statistic	df	Sig.
pertemuan2	.155	28	.083

a. Lilliefors Significance Correction

From the Kolmogorov-Smirnov Normality Test Table: statistic = 0.155, df = 28, sig = 0.083 (meaning that the data processing results are significant at a probability of $p = 0.083 = 8.3\%$). Based on the data, p in the Normality Test Table $> \alpha = 5\% = 0.05$, so the posttest data on student creativity is normally distributed.

The results of the hypothesis test are as follows:

1. The Effectiveness of Student Worksheets (LKPD) in Improving Student Learning Independence. During the learning process using the Student Worksheet (LKPD), the students appeared very enthusiastic and eager to discuss. During discussions, the students were able to position themselves as the main actors in their thinking. The students appeared happy and joyful while learning because during the learning process, they answered the test questions by calculating together with their respective groups. This behavioral observation supports the statistical data, providing qualitative evidence that LKPD engaged students cognitively and emotionally.

In addition, during the learning process, students were seen to begin taking initiative in the learning process. This is in line with Knowles' theory (in Mentz, 2021), which states that independent learning is a process in which individuals take initiative with or without the help of others in diagnosing their needs.

When given evaluation questions, students worked on the assigned tasks independently. They appeared to be serious in completing them. They seemed able to overcome the problems they faced. They did not appear confused about what to do. They seemed to understand the learning objectives that had been implemented. In addition, they also appear disciplined when studying. As stated by Guglielmino (in Mentz, 2021), students who have independent learning will act and take responsibility for what they do, function independently, have a love of learning, be future-oriented, and use basic learning skills and problem-solving skills.

Self-confidence also began to emerge when answering the questions given. The students' self-confidence in answering the questions increased. When answering the questions given, they laugh happily when they find one of their friends making a mistake in the calculation process. This is in line with Rahayu's

(2019, p. 17) opinion, which states that a student is said to have self-confidence if they are able to make their own decisions, develop skills independently, improve their abilities, and solve problems without the help of others.

The hypothesis tested was to determine the effectiveness of the Student Worksheet (LKPD) in enhancing the learning independence of fifth-grade students at State Elementary School 33 Pontianak Barat on the topic of the perimeter of two-dimensional shapes. The data analysis conducted to test the hypothesis in this study was a t-test using two paired samples.

From the Paired Samples Statistics Table:

- a. The mean learning independence of students before = 73.29, $n = 28$, and standard deviation = 8.993.
- b. The mean learning independence of students after = 85.18, $n = 28$, and standard deviation = 5.285.
- c. The correlation coefficient between pre- and post-test scores is $r = 0.679$.
- d. The t-value is -9.461, $df = 27$, and $\text{sig (2-tailed)} = 0.000$, $p < 0.05$.

The sig (p) value = 0.000, $p < 0.05$, so H_a is accepted. Therefore, it can be concluded that the use of Student Worksheets (LKPD) is effective in improving the learning independence of fifth-grade students in mathematics learning at State Elementary School 33 Pontianak Barat on the topic of the perimeter of two-dimensional shapes.

Based on the results of observations and analysis of the use of Student Worksheets (LKPD) in improving student learning independence, the results indicate effectiveness. This is evidenced by the results of the hypothesis test, where the sig value (2-tailed) is less than the significance level of 0.05 ($0.000 < 0.05$), thus the basis for accepting the hypothesis in the Paired-Samples t-test is that H_a is accepted. Additionally, an effect size calculation was conducted to assess the effectiveness of the Student Worksheet on learning independence, yielding an effect size of 1.788, which falls into the high category. Therefore, it can be concluded that the Student Worksheet (LKPD) is effective in enhancing students' learning independence.

2. The Effectiveness of Student Worksheets (LKPD) in Enhancing Student Creativity. During the learning process using Student Worksheets (LKPD), students were able to solve problems using various solutions and answers. During discussions, students thought independently. When commenting on their peers' answers, each student seemed confident that the answers they had found were correct. Students appeared very enthusiastic during the learning process. Students appear highly enthusiastic during discussions, presentations, and when expressing their opinions. This aligns with Fein's perspective (as cited in Howe & Bruno, 2010, p. 944), who explains that creativity is a unique way of thinking that enables an individual to understand the different elements of a problem and enhances their ability to think, visualize, and create alternative solutions or unconventional perspectives.

The creativity and critical thinking of the students also began to emerge when answering the questions given. The students' curiosity in answering the questions increased. When working on the questions, they laughed happily when they found one of their friends making a mistake in the calculation process. This aligns with Covey's (in Sa'diyah, 2017) identification of the characteristics of students' creativity, namely the ability to independently express ideas in an easily understandable manner and emotionally take responsibility for their own actions.

When working on the problems in the Student Worksheet (LKPD), they provided unique answers in solving the problems. This aligns with Santrock's (2011, p. 310) view that creativity is the ability to think of new ideas or things in unconventional ways and to generate unique solutions to existing problems.

Based on the results of observations and analysis of the use of the Student Worksheet (LKPD) in enhancing students' creativity, it was found to be effective. This was proven by the results of the hypothesis test, where the sig value (2-tailed) was less than the significance level of 0.05 ($0.000 < 0.05$), thus the decision criterion for the Paired-Samples t-test was that the alternative hypothesis (H_a) was accepted. Additionally, an effect size calculation was conducted to assess the effectiveness of the Student Worksheet on student creativity, yielding an effect size of 1.802, which falls into the high category. Thus, it can be concluded that the Student Worksheet (LKPD) is effective in enhancing student creativity. The hypothesis tested was to determine the effectiveness of the Student Worksheet (LKPD) in enhancing the creativity of fifth-grade students at State Elementary School 33 Pontianak Barat on the topic of the perimeter of two-dimensional shapes. The data analysis conducted in testing the hypothesis in this study was a t-test using two paired samples. From the Paired Samples Statistics Table:

- a. The mean (average) of students' learning independence before = 39.39, $n = 28$, and standard deviation = 5.788.
- b. The mean (average) of students' learning independence after = 50.21, $n = 28$, and standard deviation = 3.635.
- c. Correlation coefficient between pre- and post-scores: $r = 0.253$
- d. T-test value: -9.533, $df = 27$, and sig (two-tailed) = 0.000, $p < 0.05$

The sig (p) value = 0.000, $p < 0.05$, so H_a is accepted. Therefore, it can be concluded that the use of Student Worksheets (LKPD) is effective in enhancing the creativity of fifth-grade students in mathematics learning at State Elementary School 33 Pontianak Barat on the topic of the perimeter of two-dimensional shapes.

3. The Effectiveness of Student Worksheets (LKPD) in Mathematics Learning. The hypothesis tested was to determine the effectiveness of Student Worksheets (LKPD) in enhancing the creativity of fifth-grade

students at State Elementary School 33 Pontianak Barat in the topic of the perimeter of two-dimensional shapes. The data analysis conducted to test the hypothesis in this study was a t-test using two paired samples.

From the Paired Samples Statistics Table:

- a. The mean mathematics learning outcome before = 62.39, $n = 28$, and standard deviation = 14.469.
- b. The mean mathematics learning outcome after = 77.75, $n = 28$, and standard deviation = 17.266.
- c. Correlation coefficient between pre- and post-test scores $r = 0.791$
- d. T-test = -7.658, $df = 27$, and sig (2-tailed) = 0.000, $p < 0.05$

The sig (p) value = 0.000, $p < 0.05$, so H_a is accepted. Therefore, it can be concluded that the use of Student Worksheets (LKPD) is effective in improving mathematics learning in Grade V of State Elementary School 33 Pontianak Barat on the topic of the perimeter of two-dimensional shapes.

After testing the hypothesis at a certain level, the next step is to determine the effect size. Effect size refers to the magnitude of the effect caused by the parameter being tested in hypothesis testing. Effect size can also be considered as a measure of the success of the research. To determine the effectiveness of the Student Worksheet (LKPD) on learning independence, the effect size formula is used.

Learning independence indicates that an effect size of 1.788 falls into the high category. This shows that the use of Student Worksheets (LKPD) has high effectiveness in improving the learning independence of fifth-grade students in mathematics learning at State Elementary School 33 Pontianak Barat on the topic of perimeter of two-dimensional shapes.

Student creativity shows that the effect size of 1.802 falls into the high category. Students' creativity and critical thinking can be observed when answering the given questions. Their curiosity in answering the questions has increased. When working on the given questions, they laugh happily when they find one of their friends making a mistake in the calculation process. This aligns with Covey's (in Sa'diyah, 2017) identification of student creativity characteristics, which include the ability to independently express ideas in an easily understandable manner and emotionally take responsibility for their own activities.

When working on the problems in the Student Worksheet (LKPD), they provided unique answers in solving the problems. This aligns with Santrock's (2011, p. 310) view that creativity is the ability to think of new ideas or things in unconventional ways and to generate unique solutions to existing problems.

Based on the results of observations and analysis of the use of the Student Worksheet (LKPD) in enhancing students' creativity, it was found to be effective. This was proven by the results of the hypothesis test, where the sig value (2-tailed) was less than the significance level of 0.05 ($0.000 < 0.05$), thus the decision criterion for the Paired-Samples t-test was that the alternative hypothesis (H_a) was accepted. An effect size calculation was also conducted to assess the effectiveness of the Student Worksheet on student creativity,

yielding an effect size of 1.802, which falls into the high category. Therefore, it can be concluded that the Student Worksheet (LKPD) is effective in enhancing student creativity.

This indicates that the use of Student Worksheets (LKPD) has a high effectiveness in enhancing the creativity of fifth-grade students in mathematics learning at State Elementary School 33 Pontianak Barat on the topic of the perimeter of two-dimensional shapes.

CONCLUSION

This study produced a technology-based non-cognitive diagnostic assessment tool to measure the cooperative character and learning interest of fourth-grade students at SD Negeri 03 Pontianak Selatan. The feasibility of the non-cognitive diagnostic assessment development product based on word walls to measure cooperative character is 92.33%, categorized as highly feasible, while the web-based version achieved 99%, also highly feasible. The practicality of the word-wall-based product is 84% (very practical), and the web-based version reached 90% (very practical). The measurement of learning interest and character using this technology-assisted assessment effectively improved curricular learning outcomes of IPAS (Science and Social Studies Integration) students in class IV-C—from 78.96 to 93.61 (N-gain = 0.54, moderate category)—and mathematics students in class IV-B—from 77.25 to 88.50 (N-gain = 0.72, high category).

These results indicate that the diagnostic assessment tool was effective across different student groups and subject areas, supporting its adaptability for broader classroom implementation. The study also evaluated the use of Student Worksheets (LKPD) for fifth-grade students. Based on the results, it can be concluded that LKPD is effective in increasing learning independence and creativity in mathematics learning on the topic of flat shapes. Statistical analysis showed that the effect size for learning independence was 1.788 (high category), and for creativity, 1.802 (high category). These results demonstrate that LKPD not only improved academic achievement but also fostered essential learning behaviors such as autonomy, initiative, and creative problem-solving. Therefore, LKPD can be considered an effective learning tool to support the development of independence and creativity among students in elementary education. In summary, both innovations—technology-based diagnostic tools and LKPD—complement each other in enhancing learning outcomes. The diagnostic tool identifies and measures students' affective attributes, while LKPD provides a structured medium for improving cognitive and creative aspects. Together, they represent a comprehensive approach to advancing 21st-century competencies in elementary school education.

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