



Development of Student Worksheets Based on the Problem-Based Learning Model to Improve Students' Critical Thinking Skills in Natural and Social Sciences (IPAS) Learning in Elementary Schools

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ABSTRACT	ARTICLE INFO
<i>This research is motivated by the low critical thinking skills of students in Natural and Social Sciences (IPAS) learning in elementary schools, as well as the use of teaching materials that have not been optimally developed to support these skills. This study uses the Research and Development (R&D) method with the 4D (Four-D) development model, which consists of Define, Design, Develop, and Disseminate. The subjects of this study were fifth-grade elementary school students. Data collection techniques utilized test and non-test methods, while data analysis techniques employed qualitative and quantitative analysis. The objectives of this study are to: (1) develop Student Worksheets (LKPD) based on the Problem-Based Learning model to improve the critical thinking skills of elementary school students, (2) determine the feasibility of the Problem-Based Learning model-based Student Worksheets (LKPD), (3) determine the improvement in critical thinking skills through the use of the Problem-Based Learning model-based LKPD, and (4) determine the practicality of the Problem-Based Learning model-based LKPD based on student responses. The results showed that the developed LKPD achieved a "Highly Feasible" category with an average percentage of 90%. The developed Problem-Based Learning model-based LKPD was also effective in improving students' critical thinking skills, obtaining an N-Gain score of 0.8654 or 86.54% in the "High" category. Furthermore, student responses to the Problem-Based Learning model-based LKPD obtained an average percentage of 99% in the "Highly Practical" category.</i> © 2026 Jurnal Pedagogik Pendidikan Dasar 	Article History: Submitted/Received 03 Jul 2026 First Revised 03 Sep 2026 Accepted 07 Sep 2026 First Available online 14 Oct 2026 Publication Date 01 Nov 2026 Keywords: Student Worksheets; Problem-Based Learning Model; Critical Thinking Skills

1. INTRODUCTION

Education plays a crucial role in fostering the potential, interests, and talents of every student. Through education, students can also develop skills that will be applied in their daily lives. Education in Indonesia currently implements 21st-century education (Nurhalimah et al., 2024). This 21st-century learning is student-centered. In 21st-century learning, students must be equipped with 4C skills. Furthermore, 21st-century learning emphasizes innovation and creativity from both teachers and students (Arinie & Azmah, 2025).

In today's era of global competition, every individual is expected to possess four skills: critical thinking, communication, collaboration, and creativity. These skills are essential for navigating the 21st century and facing the various opportunities and challenges brought about by advancements in technology and information (Inayati, 2022). Critical thinking skills are paramount and must be mastered by every student, as they are considered the most crucial ability for anticipating and filtering the new information that emerges daily. In addition, to enhance their understanding of the subject matter, students' critical thinking skills must also be continuously developed throughout the learning process. According to Susanti et al., (2022), critical thinking is closely related to analytical and reflective thinking; fundamentally, critical thinking is a cognitive process aimed at making rational decisions to resolve an issue or problem.

However, various studies indicate that the critical thinking skills of students in Indonesia are still relatively low. Data from the Programme for International Student Assessment (PISA 2022) shows that Indonesia's science score declined from 396 in 2018 to 383 in 2022, placing students in a low category when it comes to answering critical thinking-based questions (OECD, 2023). Based on the results of a needs analysis conducted through a critical thinking skills test in the Natural and Social Sciences (IPAS) subject, it was found that the critical thinking skills of fifth-grade students remain low, with 89.29% of students not yet reaching the expected level of mastery and only 10.71% demonstrating adequate abilities according to critical thinking skill indicators. Furthermore, the results of an interview with the fifth-grade homeroom teacher revealed that students still experience difficulties in analyzing image-based questions, connecting learning concepts with phenomena in their surrounding environment, and answering problem-solving questions that require reasoning or personal opinions.

Meanwhile, regarding the teaching materials used in learning activities, teachers rely on textbooks provided by the government. According to the educators, the use of these teaching materials in the learning process has not yet been directed towards developing students' critical thinking skills. In addition to textbooks, teachers also prepare other teaching materials in the form of student worksheets (LKPD) to support the learning process; however, the LKPD currently implemented typically only contains questions taken directly from the textbook. Furthermore, concerning critical thinking skills and teaching materials, the instructional models employed by teachers have not been effective in improving students' critical thinking skills. The learning models used so far remain teacher-centered, with educators leaning heavily towards the lecture method during the learning process.

According to Rahmaniah et al., (2023), there are various instructional models that can be utilized to enhance students' critical thinking skills, including Project-Based Learning (PjBL), Discovery Learning, Inquiry-Based Learning, and Problem-Based Learning (PBL). From these various models, this study chose to develop Student Worksheets (LKPD) based

on the Problem-Based Learning model. The Problem-Based Learning model was selected because it incorporates challenges from everyday life aimed at training students' critical thinking skills in solving problems that require reasoning or personal opinions. This aligns with the view expressed by [Mareti & Hadiyanti \(2021\)](#), who state that the Problem-Based Learning model presents real-world or everyday problems as a context to train students in developing critical thinking skills, problem-solving abilities, and knowledge acquisition.

According to [Farizka et al., \(2021\)](#), previous research has focused on Android-based LKPDs. In contrast, this study utilizes an LKPD based on the Problem-Based Learning model, featuring a more attractive design that is organized according to the applied syntax. The syntax used in this research is based on the theory proposed by [Setiawan et al., \(2022\)](#), which includes orienting students to the problem, organizing students for learning, guiding individual or group investigations, developing and presenting results, and analyzing and evaluating the problem-solving process.

Based on these problems, this research focuses on developing Student Worksheets (LKPD) based on the Problem-Based Learning model to improve students' critical thinking skills in Natural and Social Sciences (IPAS) learning in elementary schools. The development of this LKPD is directed at determining the development process and product feasibility, the improvement of students' critical thinking skills after using the LKPD, as well as student responses to the developed LKPD. This research is expected to provide benefits in supporting the improvement of students' critical thinking skills through more active learning activities and serve as an alternative teaching material for educators to facilitate student-centered learning. Therefore, the research entitled "Development of Student Worksheets Based on the Problem-Based Learning Model to Improve Students' Critical Thinking Skills in Natural and Social Sciences (IPAS) Learning in Elementary Schools" was conducted as an effort to develop teaching materials that align with learning needs and students' critical thinking skills.

2. RESEARCH METHODOLOGY

This research uses a Research and Development (R&D) approach with a 4D development model. The 4D development model consists of Define, Design, Develop, and Disseminate ([Thiagarajan dkk., 1974](#)). The subjects of this study consisted of 28 fifth grade elementary school students selected using a purposive sampling technique based on their suitability to the research objectives. The data sources in this study consist of primary and secondary data sources. Primary data sources were obtained from the homeroom teacher, fifth grade students, and expert validators. Meanwhile, secondary data sources were obtained from books, journals, theses, articles, the internet, and other supplementary websites relevant to the research.

The data collection techniques in this study employed both test and non-test methods. The test method conducted in this research utilized a pretest and posttest in the form of essay questions to measure students' critical thinking skills after using the Problem-Based Learning model-based LKPD. Meanwhile, the non-test methods included interviews, observations, and questionnaires in the form of expert validation questionnaires and student response questionnaires. Interviews were used to explore teaching needs, observations were used to examine the teaching and learning process, validation questionnaires were distributed to experts in instruments, materials, language, teaching materials, and testing, and response questionnaires were used to determine student responses to the developed product.

The data analysis techniques in this study encompass both qualitative and quantitative data analysis. The qualitative data analysis process is carried out through three stages, namely data reduction, data display, and conclusion drawing/verification (Sugiyono, 2023). Meanwhile, quantitative data analysis is conducted using descriptive statistical techniques based on the results of expert validation assessment data, pretest-posttest scores, and student response questionnaire data. Quantitative data processing techniques utilize several formulas, including the following:

2.1 Formula for determining the feasibility of the PBL model-based LKPD through questionnaires

Formula:

$$NP = \frac{R}{SM} \times 100\%$$

Description:

NP	= Percentage value sought
R	= Total score achieved
SM	= Maximum score
100	= Constant number

The following is a table to determine the interpretation of the conclusion based on the obtained percentage score:

Table 1. Expert Validation Feasibility Categories

Percentage	Category
81% - 100%	Highly Feasible
61% - 80%	Feasible
41% - 60%	Fairly Feasible
21% - 40%	Less Feasible
≤ 20	Highly Unfeasible

(Marlinda dkk, 2023)

2.2 Formula for determining the effectiveness of the PBL model-based LKPD through pretest and posttest

Formula:

$$N\text{-Gain} = \frac{\text{Skor posttest} - \text{skor pretest}}{\text{skor maksimum} - \text{skor pretest}}$$

To determine the category of the N-Gain score improvement, one can refer to the normalized Gain criteria shown in the table below.

Table 2. Normalized N-Gain Criteria

N-Gain Score	Category
$0,70 \leq g \leq 100$	High
$0,30 \leq g < 0,70$	Moderate
$0,00 < g < 0,30$	Low
$g = 0,00$	No Improvement
$-1,00 \leq g < 0,00$	Decrease

(Sukarelawan dkk, 2024)

2.3 Formula for determining the practicality of the PBL model-based LKPD through response questionnaires

Formula:

$$NP = \frac{n}{N} \times 100\%$$

Keterangan :

NP = Percentage of student perception for each indikator

n = Total score obtained by students for each indikator

N = Total maximum score for each indikator

100 = Constant number

The following is a table to determine the interpretation of the conclusion based on the obtained percentage score:

Table 3. Interpretation of Student Response Criteria

Percentage	Category
0% - 20%	Highly Impractical
21% - 40%	Impractical
41% - 60%	Fairly Practical
61% - 80%	Practical
81% - 100%	Highly Practical

Modifikasi (Purba dkk, 2022)

3. RESULT AND DISCUSSION

3.1 Development of the Problem-Based Learning Model-Based LKPD

This research employs a research and development (R&D) methodology, yielding a product in the form of a Problem-Based Learning (PBL) model-based student worksheet (LKPD) designed to support students' critical thinking skills in IPAS (Natural and Social Sciences) learning. The LKPD development process was conducted using the 4D model, which encompasses four stages: define, design, develop, and disseminate.

The first stage is the define stage, which involves conducting a learning needs analysis encompassing an analysis of the students, tasks, materials, and learning objectives. Results from interviews and observations indicate that IPAS learning is still predominantly teacher-centered. Furthermore, the teaching materials utilized are conventional printed worksheets that have not been tailored to students' needs, resulting in passive student engagement and low critical thinking skills. The results of the initial proficiency test reveal that a significant number of students have not yet achieved the expected level of critical thinking skills. Based on the material analysis, Chapter 8, Topic B, "Oh, the Environment is Damaged," was selected because it presents contextual problems highly relevant to the students' daily lives, particularly concerning environmental changes and waste management. Driven by the results of this analysis, a Problem-Based Learning (PBL) model-based LKPD was developed. This LKPD is aligned with the learning outcomes and objectives, and it incorporates activities such as identifying problems, gathering information, engaging in discussions, formulating solutions, and drawing conclusions.

The second stage is design, which involves conceptualizing the product based on the needs analysis results. During this stage, the media and product format were selected, specifically a Problem-Based Learning (PBL) model-based LKPD covering the topic of environmental change for Grade V students. The LKPD was designed using the Canva application, beginning with the development of a storyboard, followed by determining the design, colors, elements, and content aligned with the PBL syntax. This syntax comprises orienting students to the problem, organizing students for learning, guiding investigations, developing and presenting results, and analyzing and evaluating the problem-solving process. The LKPD was printed in A4 format, featuring an Art Carton cover and Art Paper for the interior pages. The initial draft of the LKPD included a front cover, author and expert lecturer profiles, a foreword, a table of contents, usage instructions, learning identities, the PBL syntax, learning activities, an evaluation section, a bibliography, an author biography, a slogan, and a back cover.

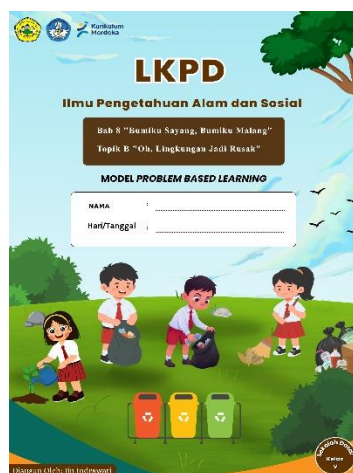


Figure 1. Front Cover



Figure 2. Student Activities



Figure 3. Back Cover

The third stage is development, which begins with expert evaluation. Prior to distributing the questionnaires to product validators, the validation questionnaire was reviewed by an instrument expert to ensure the suitability of the instruments used. Subsequently, the Problem-Based Learning model-based LKPD was evaluated by subject matter, language, and teaching material experts to assess product feasibility. Following this, the test instruments were evaluated by a testing expert to ensure the alignment of the items with the learning objectives and critical thinking skill indicators used in the study.

The fourth stage in the 4D model is disseminate. At this stage, the Problem-Based Learning (PBL) model-based LKPD, which had been deemed feasible, was implemented on a limited scale in a single school with 28 Grade V students. This implementation was conducted to apply the LKPD in IPAS learning and evaluate student responses to the developed worksheet. The learning process using the LKPD was aligned with the Problem-Based Learning syntax, spanning from orienting students to the problem, organizing students for learning, guiding investigations, and developing and presenting results, to analyzing and evaluating the problem-solving process.

3.2 Feasibility of the Problem-Based Learning Model-Based LKPD

The designed Problem-Based Learning (PBL) model-based LKPD was subsequently evaluated through several assessment stages to determine its feasibility. Prior to conducting validation with subject matter, language, teaching material, and test instrument experts, the researchers first validated the evaluation questionnaires with an instrument expert to ensure the suitability of the instruments used in the product validation process. The validation results from the instrument expert are presented in the table below.

Table 4. Questionnaire Instrument Validation Results	
Aspect	Instrument Expert Assessment
Clarity	21
Content accuracy	9
Language accuracy	13
Total	43
Percentage	$\frac{43}{50} \times 100\% = 86\%$
Feasibility category	Highly Feasible

Based on the table, the questionnaire instrument validation yielded a percentage of 86%, falling into the "Highly Feasible" category, indicating that the instrument could be used in the research. Nevertheless, based on the validator's feedback and suggestions, several aspects required revision: adding a language accuracy aspect regarding effective sentence usage, citing references for the formulas and scoring criteria applied, and refining the conclusion section to display the obtained score prior to categorizing the final conclusion. Subsequently, the designed LKPD underwent validation by a subject matter expert to evaluate the feasibility of the content presented in the product. The validation results from the subject matter expert are presented in the table below.

Table 5. Material Validation Results			
Aspect	Expert Assessment		
	Subject Matter Expert 1	Subject Matter Expert 2	Subject Matter Expert 3
Relevance	16	19	20
Accuracy	12	15	14
Communicativeness	12	14	12
Total	40	48	46
Percentage	$\frac{40}{50} \times 100\% = 80\%$	$\frac{48}{50} \times 100\% = 96\%$	$\frac{46}{50} \times 100\% = 92\%$
Average	89%		
Category	Highly Feasible		

Based on the table, the material expert validation yielded a percentage of 89%, categorized as "Highly Feasible," indicating that the content within the LKPD is suitable for use in learning activities. Based on the feedback and suggestions provided by the

material validator, several aspects required improvement, including clarifying the presentation sequence of activities, adding a glossary to the LKPD, and incorporating illustrations into the stories featured in the worksheet. Subsequently, the designed LKPD underwent validation by a language expert to evaluate the linguistic feasibility of the product. The validation results from the language expert are presented in the table below.

Table 6. Language Validation Results

Aspect	Expert Assessment	
	Language Expert 1	Language Expert 2
Straightforwardness	20	14
Communicativeness	15	13
Compliance with EYD	14	13
Total	49	40
Percentage	$\frac{49}{50} \times 100\% = 98\%$	$\frac{40}{50} \times 100\% = 80\%$
Average	89%	
Category	Highly Feasible	

Based on the table, the language expert validation yielded a percentage of 89%, categorized as "Highly Feasible," indicating that the language used in the LKPD is suitable for learning activities. Based on the feedback and suggestions provided by the language validator, several parts required revision: making the title on the front cover more visually appealing and uncrowded, shortening the LKPD usage instructions to be more concise and direct, and refining the sentence phrasing within those instructions. Subsequently, the designed LKPD underwent validation by a teaching materials expert to evaluate the feasibility of the instructional material presented in the product. The validation results from the teaching materials expert are presented in the table below.

Table 7. Teaching Material Validation Results

Aspect	Expert Assessment	
	Teaching Material Expert 1	Teaching Material Expert 2
LKPD appearance	32	37
LKPD presentation	20	19
Alignment of LKPD with the PBL model	24	23
Total	76	79
Percentage	$\frac{76}{85} \times 100\% = 89\%$	$\frac{79}{85} \times 100\% = 92\%$
Average	91%	
Category	Highly Feasible	

Based on the table, the teaching material expert validation yielded a feasibility percentage of 91%, categorized as "Highly Feasible," indicating that the Problem-Based Learning (PBL)-based LKPD is suitable for use in learning activities. Based on the

feedback and suggestions provided by the teaching material validator, several parts required revision: adjusting the layout and size of the student identity section on the front cover, featuring student illustrations that reflect diversity, adjusting the facial expressions of students in the illustrations, and clarifying the presentation sequence of activities within the LKPD. The recapitulation of the validation results from the subject matter expert, language expert, and teaching material expert is presented in the table below.

Table 8. Recapitulation of Expert Validation Results

Validation Results	Percentage	Criteria
Subject Matter Expert	89%	Highly Feasible
Language Expert	89%	Highly Feasible
Teaching Material Expert	91%	Highly Feasible
Average Score	90%	Highly Feasible

Subsequently, the designed test instrument underwent validation by a test instrument expert to evaluate the feasibility of the test items to be used in the research. The validation results from the test instrument expert are presented in the table below.

Table 9. Test Instrument Validation Results

Aspect	Instrument Expert
Content / Material	13
Item construction	18
Linguistic accuracy	19
Total	50
Percentage	$\frac{50}{55} \times 100\% = 91\%$
Category	Highly Feasible

Based on the table, the test instrument expert validation yielded a feasibility percentage of 91%, categorized as "Highly Feasible," indicating that the test instrument is suitable for use in the research. Based on the feedback and suggestions provided by the test instrument expert, several parts required revision: completing the student identity section with class and day/date, adding instructions for completing the test, refining the introductory sentence for question number 1, and replacing the punctuation mark in question number 1 with a question mark.

3.3 Improvement of Elementary School Students' Critical Thinking Skills

The improvement in students' critical thinking skills was analyzed based on pretest and posttest results using the N-Gain test. This analysis aimed to determine the enhancement of students' critical thinking skills after using the Problem-Based Learning (PBL)-based LKPD. The analysis results are presented in the table below.

Table 10. N-Gain Results

	Pretest	Posttest	N-Gain	N-Gain	Description
Mean	Score	Score	Score	Score (%)	
	16,90%	89,65%	0,8654	86,54%	High

Based on the table, the N-Gain calculation results show an average score of 0.8654 or 86.54%, which falls into the "High" category. These results indicate an improvement in students' critical thinking skills after using the Problem-Based Learning (PBL)-based LKPD on the topic of environmental change..

3.4 Students' Responses to the Problem-Based Learning (PBL)-Based LKPD

Following the implementation of the LKPD in learning, a practicality assessment was conducted to determine the ease of use of the LKPD based on student responses. The practicality assessment was carried out through a student response questionnaire. The assessment results are presented in the table below.

Table 11. Student Response Results	
Aspect	Student Response
Material	167
LKPD	138
Total	305
Percentage	$\frac{305}{308} \times 100\% = 99\%$
Category	Highly Practical

Based on the table, the student response results yielded a percentage of 99%, which falls into the "Highly Practical" category. These results indicate that the developed material and LKPD are highly practical for use in the learning process and received a very positive response from students.

Discussion

This research is a research and development (R&D) study that produced a final product in the form of a Problem-Based Learning (PBL)-based LKPD (Student Worksheet) on the topic of environmental change, designed to improve the critical thinking skills of Grade V elementary school students. The developed LKPD is tailored to student characteristics and learning needs, featuring activities that enable students to actively engage in understanding problems, conducting investigations, engaging in discussions, determining solutions, presenting results, and evaluating the problem-solving process. The development of this LKPD followed the 4D model, which consists of define, design, develop, and disseminate.

As a basis for product development, the initial phase involved a needs analysis through interviews with Grade V teachers and classroom observations. The interview results indicated that students still struggled with understanding concepts, solving problems, and thinking critically, alongside demonstrating low active participation in learning. This situation was influenced by instruction that remained predominantly teacher-centered. This aligns with [Situmorang & Laksono \(2025\)](#), who noted that teacher-centered learning tends to be monotonous, leaving students less motivated and more passive in the learning process. Additionally, teachers had not independently developed LKPDs and were still relying on publisher-printed worksheets that lacked variety and did not fully meet student needs. Observation results further revealed that learning was dominated by lecture-style teaching, reliance on standard textbooks and printed worksheets, and a lack of group discussion activities. These conditions highlighted the urgent need to develop a PBL-based LKPD

that actively involves students in analyzing problems, discussing, seeking solutions, and drawing conclusions. According to [Nafisa et al., \(2025\)](#), the PBL model fosters active learning by presenting contextual problems, enabling students to apply their knowledge to real-life situations.

The need for learning that can develop critical thinking skills was further reinforced by observation results and initial ability tests. The results indicated that the critical thinking skills of Grade V students were still categorized as low. Many students had not yet achieved the expected level of mastery, with only a few demonstrating adequate critical thinking abilities. This condition indicates that students still require instruction that provides broader opportunities to develop their thinking capabilities. Therefore, the LKPD was developed by integrating PBL-based activities so that students do not merely receive information, but are actively involved in identifying problems, gathering information, engaging in discussions, determining solutions, and summarizing learning outcomes.

Based on these initial ability conditions, selecting appropriate material became an essential part of the LKPD development process to ensure that the learning activities could connect the subject matter with issues close to the students' daily lives. The material chosen was Chapter 8, Topic B, "Oh, Lingkungan Jadi Rusak" ("Oh, The Environment Is Damaged"), as it directly relates to everyday problems encountered by students, such as waste management and environmental degradation. The material encompasses environmental change, the relationship between humans and waste, types of waste, and waste management through the 3R principles (reduce, reuse, recycle). This topic selection aligns with the characteristics of PBL, enabling students to learn concepts through real-world problems close to their environment. The activities designed within the LKPD include reading contextual problems, identifying issues, asking questions, gathering information, discussing to find solutions, documenting discussion results, presenting outcomes, and conducting reflections as well as drawing conclusions. According to [Putri et al., \(2025\)](#), task analysis aims to identify the core tasks that students must master to achieve the expected competencies.

The determined content and activities subsequently served as the foundation for designing the LKPD. The design process was carried out with due regard to learning outcomes, learning objectives, student characteristics, and the syntax of the PBL model. The LKPD was designed using the Canva application, starting with the creation of a storyboard, followed by selecting the design layout, color scheme, visual elements, and content of the LKPD. The components included in the LKPD comprise the front cover, identities of the author and expert lecturers, foreword, table of contents, instructions for use, learning identity, PBL syntax, learning activities, evaluation, references, author biography, slogan, and back cover. The LKPD was printed in A4 format using Art Carton paper for the cover and Art Paper for the body pages to enhance visual appeal and user comfort.

After the LKPD draft was developed, an instrument was required to collect evaluations of the product. One of these instruments was a questionnaire instrument, which was first validated by a questionnaire instrument expert to ensure the feasibility of each aspect and item statement used. The validation result for the questionnaire instrument achieved a percentage score of 86%, categorized as "Highly Feasible," making it suitable for use in the study. Nevertheless, the validator provided several

critiques and suggestions for instrument improvement. The recommended revisions included adding an aspect regarding language precision specifically the use of effective sentences citing references for the formulas and scoring criteria used, and refining the conclusion section by presenting the obtained score prior to classifying the final conclusion. These suggestions then served as the basis for refining the questionnaire instrument before its application in the LKPD evaluation process.

After the questionnaire instrument was declared highly feasible and revised according to the validator's suggestions, it was used to assess the feasibility of the LKPD. The assessment was conducted by three expert teams: subject matter experts, language experts, and instructional material experts. Based on the evaluation results from all three experts, an average validation percentage of 90% was achieved, falling into the "Highly Feasible" category. These results indicate that the developed LKPD has met the criteria for content feasibility, language quality, presentation layout, visual design, as well as alignment with student characteristics and the syntax of the PBL model. The feasibility of the content within the LKPD demonstrates that the material presented aligns with learning objectives, student needs, and student capabilities. This finding is in line with research by [Lestari & Rigianti \(2026\)](#), which states that high content validation shows the suitability of LKPD content to learning needs and elementary school students' abilities. Furthermore, consistent with previous research by [Susilawati et al., \(2025\)](#), highly valid material validation results demonstrate that the LKPD meets content feasibility standards and is suitable for use in instruction.

The feasibility of the LKPD was further supported by assessments of its language quality and instructional material design. In terms of language, the LKPD employs wording that conforms to standard linguistic conventions, remains communicative, and is easily understood by students. In line with [Nasution et al., \(2024\)](#), using simple and communicative language helps students better comprehend learning materials. Meanwhile, regarding the instructional material aspects, the LKPD fulfilled requirements related to visual layout, presentation structure, and alignment with PBL syntax. The validators also provided feedback concerning the placement of student identity sections, the addition of illustrations within learning activities, and clearer activity presentations. This finding is supported by research from [Hariyati et al., \(2025\)](#), which indicates that PBL-based learning materials featuring appealing visual design, systematic presentation, and alignment with student characteristics can increase student interest and active engagement in learning. Overall, the validation results from all three experts demonstrate that the developed Problem-Based Learning-based LKPD meets all feasibility criteria and is ready for implementation in the learning process. These findings align with [Setyoko & Indarini \(2024\)](#) showing that PBL-based LKPDs with high validation ratings are suitable as instructional tools to foster active learning and enhance students' critical thinking skills.

Once the feasibility of the LKPD was established, the feasibility of the instrument used to measure students' critical thinking skills also needed to be verified. The development of the test instrument aimed to measure students' critical thinking skills regarding environmental change. The instrument consisted of essay-form pretest and posttest questions constructed based on learning outcomes, learning objectives, and critical thinking indicators. Menurut [Facione \(2015\)](#), critical thinking indicators comprise interpretation, analysis, evaluation, inference, explanation, and self-

regulation. The instrument was subsequently validated by a test instrument expert and achieved a percentage score of 91%, falling into the "Highly Feasible" category, alongside several suggestions for revising punctuation and sentence phrasing. Next, the instrument underwent testing for validity, reliability, and item difficulty. This is in line with [Zayrin et al., \(2025\)](#), who stated that a valid and reliable instrument with an appropriate level of difficulty will yield data that accurately reflects actual conditions. The instrument tryout was conducted with 33 Grade VI elementary school students, conforming to [Sugiyono, \(2024\)](#) who asserts that instrument testing can be carried out with a minimum of 30 respondents.

After the questionnaire instrument, LKPD, and test instrument underwent the evaluation process and were declared feasible for use, the next phase was product implementation in classroom instruction. The LKPD was implemented with 28 Grade V elementary school students. During the learning process, students participated in activities using the developed PBL-based LKPD. Learning was carried out through activities that guided students to comprehend problems, conduct investigations, engage in discussions, develop solutions, present results, and reflect on the learning process. The measurement of critical thinking skill improvement was conducted by comparing students' abilities before and after using the LKPD through pretest and posttest evaluations.

The implementation of the learning activities subsequently produced data used to evaluate the improvement in students' critical thinking skills following the use of the LKPD. Based on the analysis of critical thinking skill enhancement using the N-Gain Score, an average N-Gain score of 0.8654 or 86.54% was achieved, categorized as "High." These results demonstrate an improvement in students' critical thinking skills after engaging in instruction using the Problem-Based Learning (PBL)-based LKPD. This improvement indicates that the developed LKPD effectively delivers learning experiences that prompt students to comprehend information, analyze problems, evaluate information, draw conclusions, and provide explanations based on given problems. This finding aligns with research by [Setyoko & Indarini \(2024\)](#) which indicates that instruction based on the PBL model effectively improves critical thinking skills through contextual problem-solving activities. The PBL activities embedded in the LKPD offer students direct engagement in the problem-solving process, ensuring that critical thinking abilities are fostered not only through routine content delivery, but through active and contextual learning experiences.

This improvement in critical thinking skills was subsequently complemented by student response data to determine the practicality of the LKPD after its implementation in the learning process. The student response results achieved a percentage of 99%, categorized as "Highly Practical." This high percentage indicates that the developed LKPD can be used practically in the learning process and received a very positive response from students. These results show that the LKPD helps students participate in problem solving based learning activities more easily and in a structured manner. This finding is supported by [Hariyati et al., \(2025\)](#) who stated that Problem-Based Learning-based LKPDs can enhance critical thinking skills through real-world problem-solving activities.

4. CONCLUSION

Based on the research results of developing Student Worksheets (LKPD) based on the Problem-Based Learning model to improve students' Critical Thinking Skills in Natural and Social Sciences (IPAS) learning in elementary schools, it can be concluded that the LKPD development was conducted using the 4D (Four-D) model, which encompasses Define, Design, Develop, and Disseminate. The feasibility test results indicate that the LKPD falls into the "highly feasible" category with an average score of 90%, making it suitable for implementation in the learning process. The use of the LKPD has also been proven capable of improving students' critical thinking skills, as demonstrated by an N-Gain score of 0.8654 or 86.54% in the "high" category. Additionally, student responses to the use of the LKPD reflect a highly practical experience, with an average questionnaire percentage of 99%. Therefore, the Problem-Based Learning model-based LKPD is recommended as a reference for schools, teachers, students, and other researchers in developing creative and innovative teaching materials, as well as in enhancing the quality of learning and students' critical thinking skills.

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