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DEVELOPMENT OF PBL-BASED LKPD ON HUMAN DIGESTIVE SYSTEM MATERIAL FOR GRADE VIII JUNIOR HIGH SCHOOL

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Abstract

This study aimed to develop a Problem-Based Learning (PBL) based Learning Media LKPD for Digestive System material for Grade VIII Junior High School and to test the product's validity and practicality. The PBL-based LKPD was expected to aid educators in the learning process. This development research (R&D) employed the ADDIE model. Research instruments included expert validation questionnaires for media and material experts, practitioner validation questionnaires given to junior high school science teachers (n=4), and readability test questionnaires given to Grade VIII students (n=108). Data analysis used descriptive quantitative methods. Results showed media validation at 95.24%, material validation at 87.78%, practicality validation at 90.16%, and readability tests averaged 84.46%. Thus, the PBL-based LKPD on the digestive system material was highly valid and practical for educational use.

Keywords*: Learning Media, LKPD, PBL, Digestive System*

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INTRODUCTION

The learning process involves teachers, students, and teaching materials within the educational scope. In other words, the learning process is a study process supported by learning resources and instructional media to help students learn effectively (Rohmah, 2017). Consequently, educators need to innovate with teaching materials to enhance student understanding (Tiara et al., 2023). According to Faujiah et al., (2022), some teaching materials that can support learning include modules, textbooks, videos, CDs, and worksheets.

According to Tiara et al., (2023), one of the most favored teaching materials in learning is the LKPD (Student Worksheets) because it has a simpler structure compared to modules, making it easier to use. Similarly, Saleh & Mirna (2021) argue that LKPD (Student Worksheets) are favored due to their simpler structure compared to modules. The Student Worksheet is a compilation of pages containing summaries and questions that students must complete. LKPD actively engages students, fostering interaction between teachers and students (Ariani & Meutiawati, 2020). Through LKPD, students can gain new knowledge with clear guidance. Thus, students can actively learn and find solutions to the problems presented in the LKPD (Rahmawati & Wulandari, 2020).

In addition to learning media, the use of models and methods in teaching is also important for the success and quality of teaching and learning. Thus, educators are required to wisely choose methods to ensure the teaching process is successful. According to Yusuf (2016), a learning model is a method applied by educators to engage with students during the learning process. One example of a learning model is Problem-Based Learning (PBL). Problem-Based Learning (PBL) is a student-centered model enhancing critical thinking and real-life problem-solving skills (Yuniar et al., 2022). Through this learning model, students can develop their problem-solving skills, making this approach often associated with contextual problems. Therefore, the problem-based learning model is very effective in training students' critical thinking abilities (Thahara et al., 2017).

Based on interviews with junior high school science teachers, it was found that the teaching and learning activities are still teacher-centered, with traditional lecture methods being applied. Additionally, classroom learning activities only use textbooks, modules, and student worksheets (LKS), making the learning process tend to be passive and less attractive. A fundamental problem found in student assignments is that they only use LKS containing questions, which makes the activities less interactive. According to research conducted by Aini et al., (2018), the use of LKS alone is insufficient for learning because it consists of questions without explaining the process of how to answer them.

One of the topics suitable for implementation in the Problem-Based Learning (PBL) model is the digestive system lesson because it aligns with learning outcomes, which involve analyzing the relationship

between organ systems and their functions, as well as disorders related to digestion. Based on the outlined learning outcomes, students are expected to be able to analyze and develop problem-solving skills related to digestive system issues. This is consistent with Sanjaya & Ratnasari (2021), who argue that the digestive system material is suitable for problem-based learning as it trains students to find solutions to problems. Similarly, problems related to the digestive system are often linked to everyday life (Priyanti & Manuaba, 2022).

Based on interviews with junior high school science teachers, it was revealed that current teaching methods were mostly teacher-centered, utilizing textbooks and traditional worksheets, which resulted in passive learning. This research aimed to develop PBL-based LKPD for the digestive system to address these issues and improve student engagement.

RESEARCH METHODOLOGY

This research was a type of Research and Development (R&D) aimed at creating a PBL-based LKPD to assist educators in teaching the Digestive System material. The development follows the ADDIE model: Analyze, Design, Develop, Implement, and Evaluate. The selection of the ADDIE model aligns with the theory of Angko and Mustaji as stated in (Safitri & Aziz, 2022), which suggests that the ADDIE model provides a structured framework for the development of instructional interventions, including revision and evaluation at each stage. Below is a diagram of the ADDIE model stages.

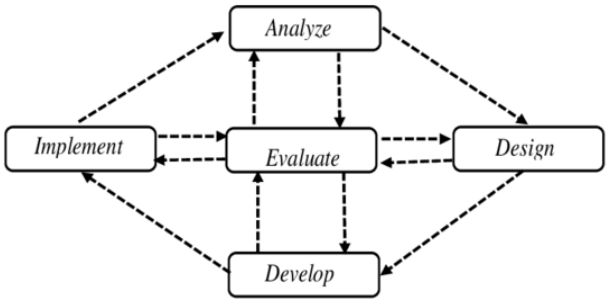


Figure 1. Stages of the ADDIE Model
Source: (Safitri & Aziz, 2022)

The stages of development in this research include the Analyze stage, which involves analyzing the problems in the school regarding the teaching materials applied. In this stage, information is collected about the issues that educators and students encounter so that the researcher can provide efficient solutions in developing the media intended for learning activities. Next is the Design stage or product planning, which has been tailored to the Analysis stage, involving the determination of media, design, and colors. Then, the Develop stage involves creating the designed media as predetermined and validated by expert instructors and readability tested on students. The next stage is Implementation, which involves implementing the LKPD learning media involving students. However, this research only goes up to the development stage; therefore, the implementation stage is not carried out. The final stage is Evaluation, which involves assessing and improving errors and feedback from validators aimed at refining the product used.

The subjects included science education lecturers, junior high school science teachers (n=6), and Grade VIII students (n=108) who served as readability test respondents for the developed LKPD. Data collected includes qualitative and quantitative data. Qualitative data is obtained from the results of needs analysis interviews. Meanwhile, quantitative data is obtained from the analysis of student needs, media validity test (material and media), media practicality tests, and media readability tests. Below is the table of research techniques conducted.

Table 1. Research Techniques
Source: Personal Document (2024)

Data Type	Test Name	Research Technique	Subject	Analysis Method
Qualitative	Needs Analysis Test	Interview	2 Junior High School Science Teachers	Descriptive Analysis
Quantitative	Analysis Of Students Needs	Questionnaire	32 Grade VIII Students	

	Media Validity Test		Expert Lecturer	Statistical Analysis of Likert Scale
	Material Validity Test		Expert Lecturer	
	Media Practicality Test		4 Junior High School Science Teachers	
	Students Readability Test		108 Grade VIII Students	

Based On Table 1, It Is Shown That There Are Six Tests In The Study That use interview and questionnaire techniques in data collection. Similarly, the subjects and analysis methods vary according to the objectives. Below are the categories of product validity determined using the following reference.

Table 2. Criteria for Validity
Source: (Arikunto, 2009)

Percentage (%)	Crtieria for Validity
81.00 - 100.00	Very Valid
61.00 - 80.00	Valid
41.0 - 60.00	Acceptably Valid
21.00 - 40.00	Less Valid
00.00 - 20.00	Very Invalid

Based on the validity criteria presented in the table, the LKPD can be considered valid if the resulting percentage is ≥61%. The validation results are then analyzed quantitatively in the form of numbers, expressed in percentages, and calculated based on Likert scale assessments as shown in Table 3.

Table 3. Likert Scale Assessment
Source: (Sugiyono, 2018)

Assessment	Score
Strongly Agree	4
Agree	3
Disagree	2
Strongly Disagree	1

RESEARCH RESULTS AND DISCUSSION

Needs Analysis

The initial stage of this research involves conducting a needs analysis aimed at analyzing and determining the underlying problems for the development to be carried out. This analysis is conducted by interviewing two junior high school science teachers. Below is the table of results from the needs analysis interviews with teachers.

Table 4. Analysis of Teacher Needs Results
Source: Personal Document (2024)

No.	Answer to the Question
1.	The teaching materials that have been used are those tailored to the students' learning styles, namely videos, handouts, textbooks, and worksheets.
2.	The teaching materials used are inadequate because the most frequently used material is the textbook.
3.	The method most frequently used in teaching is the lecture method to facilitate students' understanding of the material.
4.	The challenge in teaching the digestive system is with the material on digestive system disorders due to the lack of real-life examples.

5.	Highly interested in developing PBL-based worksheets to add variety to teaching materials and to train students' critical thinking skills.

Based on the needs analysis results, it is evident that the development of problem-based learning media (LKPD) is highly promising. This is because current learning activities are teacher-centered with traditional lecture methods, resulting in low student engagement. According to Assyifa et al., (2023), teacher-centered learning can make students passive as they are not given enough opportunities to express their opinions. Furthermore, instructional materials currently used such as textbooks, modules, and worksheets only contain exercises, which makes learning less effective. This aligns with the statement that worksheets containing only brief material and exercises can hinder students' comprehension and are thus considered ineffective. However, integrating problem-based learning models can make these instructional materials more effective and efficient in teaching (Sujarwo, 2021)

Besides the analysis of teacher needs, a student needs analysis was conducted for the development of PBL-based LKPD using a student needs questionnaire.

Table 4. Analysis of Students Needs Results
Source: Personal Document (2024)

No.	Answer to the Question
1.	Students often experience difficulties in learning science, particularly on the topic of the digestive system.
2.	Students use worksheets (LKS) and textbooks in their learning.
3.	Students prefer learning using print-based media.
4.	Students need alternative teaching materials that can support the learning process of science, especially on the topic of the digestive system.

Based on the student needs analysis, it is evident that students experience difficulties in learning the digestive system material because the teaching materials used in learning are insufficiently supportive, as they only contain material and practice questions. This is consistent with the statement that teaching materials that only include content that does not align well with the curriculum implemented in schools result in suboptimal learning and make it difficult for students to understand the material (Wahdah, 2016). Additionally, Alim, (2020) also argues that the use of teaching materials can be optimized if the teaching methods used are also enjoyable, which can facilitate students' understanding.

Based on the results obtained, it can be seen that students prefer learning using print-based teaching materials. This is because print-based materials make it easier for students to work on questions directly on the provided sheets and make notes on the materials (Puspitasari, 2019). However, according to Magdalena et al., (2020), the use of print-based teaching materials also has drawbacks, such as the inability to display videos or animations, though this can be addressed by adding barcodes for accessing videos. LKPD teaching materials with the PBL method are an example of materials that can aid student understanding and prevent boredom. This is because these LKPD are equipped with videos, pictures, and experiments that support the learning material (Lestari & Suyoso, 2018).

Validation of Problem-Based Learning (PBL) Based LKPD

The stage after product development involves validation by subject matter experts and media experts in science education at Universitas Negeri Malang. The validation data results from these subject matter and media experts are as follows.

Table 6. Data Obtained from Media Expert Validation
Source: Personal Document (2024)

Evaluation Aspect	Avarage Score (%)
Didactic Aspects	
The cover design of the PBL-based LKPD is attractive.	100
The use of fonts and typography	100
The presentation of the PBL-based LKPD is appealing.	75
The layout of text and images	100
The images presented are effective in conveying messages about the learned material.	75
Both the design and layout of each page in the PBL-based LKPD are appealing and enhance reading interest.	100

Typography of sentences and content in the PBL-based LKPD	100
Average score for each aspect	**92,86**
Language Aspects	
The use of language is adjusted to the students' intellectual level.	100
The sentences used are easy for students to grasp.	100
The language used in the instructions of the LKPD is clear and precise.	100
The LKPD uses communicative language effectively.	100
The language in the LKPD is not ambiguous.	100
Average score for each aspect	**100**
Constructive Aspects	
The problem syntax in the LKPD on the human digestive system topic is clear.	75
The problem-based LKPD organizes the content of each chapter correctly.	100
The questions presented can be answered through processing various information.	100
There are adequate sections for filling in answers, providing flexibility for students.	100
There are clear and beneficial objectives for the students.	100
There is a column for student identification in the LKPD.	100
News discourse can be developed with various presentations of information.	75
Average score for each aspect	**92,86**
Average	**95,24**
Criteria for Validity	**Very Valid**

Table 7. Data Obtained from Materr Expert Validation
Source: Personal Document (2024)

Evaluation Aspect	Avarage Score (%)
Didactic Aspects	
The concept of the material presented aligns with the Learning Outcomes and learning objectives that are easily understood in the topic of the human digestive system.	75
All the material presented comprehensively covers the content of the digestive system, complete and suitable for the eighth-grade level in middle school education.	75
The learning activities in the PBL-based LKPD aim to train students' critical thinking skills.	100
The accuracy of the material or discourse presented is appropriate and easy to understand.	75
The depth of the material corresponds to the students' learning outcomes in the Merdeka Curriculum.	75
The development of concepts related to daily life	100
The completeness of concepts regarding the digestive system	50
The novelty of the digestive system material aligns with advancements in scientific knowledge.	75
The material and issues presented about the digestive system are relevant, connecting factual information with concepts.	100
Average score for each aspect	**80,56**
Language Aspects	
Use of language adjusted to students' intellectual level	100
Accuracy in using sentences that are easily understood by students	100

Accuracy in using language in instructional activities, ensuring instructions are clear and comprehensible	100
Clarity in the use of communicative language	75
Clarity in language use that avoids ambiguity	100
Average score for each aspect	**95,00**
Average	**87,78**
Criteria for Validity	**Very Valid**

In practicality validity conducted by middle school science teachers (n = 4), the results of the practicality validation data for the PBL-based LKPD are as follows.

Table 8. Practicality Validation Results
Source: Personal Document (2024)

Evaluation Aspect	Avarage Score (%)
Cover	
Arrangement of layout elements with an attractive cover design	87,50
Clarity of text with appropriate font style and size	87,50
Avoidance of excessive use of different font combinations	87,50
Eye-catching image display and cover colors that capture attention	100
Average score for each aspect	**90,63**
Contents	
Font size and style in the worksheet (LKPD) are easy to read	93,75
The images in the worksheet are appropriate for the digestive system topic	87,50
The color scheme in the worksheet (LKPD)	93,75
The language used in the worksheet (LKPD) is simple and easy to understand	93,75
Instructions for using the worksheet (LKPD) are sequential and easy to understand	87,50
Layout arrangement in each worksheet (LKPD) is attractive	93,75
Average score for each aspect	**91,67**
Subject Matter	
The material concept presented aligns with Learning Outcomes and learning objectives that are easily understood in the topic of the human digestive system	93,75
The content in the LKPD is relevant to the learning objectives that students need to master	87,50
The accuracy of the material or discourse presented is appropriate and easy to understand	87,50
Learning activities in the PBL-based LKPD aim to train students' critical thinking skills	87,50
The developed concepts relate to daily life	93,75
The completeness of concepts regarding the digestive system	87,50
The novelty of the digestive system material aligns with advancements in scientific knowledge	87,50
The material and issues presented about the digestive system are relevant, connecting factual information with concepts	81,25
Learning activities using PBL-based LKPD can help students develop critical thinking skills	87,50
Average score for each aspect	**88,19**
Average	**90,16**
Criteria for Validity	**Very Valid**

The readability test was conducted with eighth-grade middle school students (n = 108). The results and analysis of the students' readability test data on the developed LKPD are presented in the following table.

Table 9. Student Readability Test Results
Source: Personal Document (2024)

Evaluation Aspect	Avarage Score (%)
Content Aspects	
I feel that the learning objectives in the LKPD are clear	84,72
I feel that the stories or phenomena in the LKPD often occur in daily life	80,56
I feel that the questions in the LKPD are easy to understand	80,32
I feel that the instructions in the LKPD are clear and easy to understand	82,41
I feel that this LKPD can train critical thinking skills	83,56
Average score for each aspect	**82,31**
Language Aspects	
I feel that the sentences used in the LKPD are easy to understand	83,33
I feel that the language used in the LKPD is clear and easy to understand	85,65
Average score for each aspect	**84,49**
Utilization Aspects	
I feel that the LKPD is easy to use in learning	100
I feel that this LKPD is engaging and not boring in learning	81,25
I feel that having this LKPD makes it easier to understand the material	81,02
Average score for each aspect	**87,42**
Presentation and Graphic Design Aspects	
The LKPD includes subjects, topics, subtopics, and time allocation	81,25
The LKPD includes identification such as name, attendance number, and class	86,11
I feel that the presented images can facilitate and clarify understanding in the LKPD	86,57
I feel that the appearance of the LKPD is visually appealing	81,71
I feel that the answer columns and tables in the LKPD make it easier to write answers	82,41
Average score for each aspect	**83,61**
Average	**84,46**
Criteria for Validity	**Very Valid**

Validation Result: media validation averaged 95.24%, indicating high validity. Regarding the didactic aspect of images, expert lecturers commented that relevant images or illustrations could be added to the LKPD (Student Worksheet) to foster students' desire to learn. This aligns with the statement that the appearance of images in the LKPD is very important because students are attracted to the visuals rather than the content (Widjajanti, 2008). Furthermore, for the sub-topics on nutrition and disorders of the digestive system, discussions or news articles could be added to help students understand the issues presented.

Material validation averaged 87.78%, also indicating high validity. The validation expert provided feedback on the accuracy of the concept, suggesting that the definition of the digestive system in the sentence “the process of breaking down food into smaller nutrients” is incomplete and needs to be revised according to Rohmah & Roviati, (2021), which states “the process of breaking down complex molecules into simple molecules so they can be absorbed by the digestive tract.” Additionally, the expert validator also commented that the didactic aspect of the completeness of the material on the digestive system is lacking because the developed LKPD only contains questions and not content like a handout or module.

Practicality validation by teachers averaged 90.16%, which is considered very valid for application. Practitioners provided feedback on the question, “How often is it permissible to consume instant noodles and carbonated drinks,” suggesting it be revised because it may encourage students to consume these products. However, the inclusion of this question aims to create discussion among students, making the learning process more engaging. To prevent such encouragement, educators as facilitators can provide summaries and

assessments of the students' findings. This aligns with Nafiah (2014), who states that educators act as facilitators by monitoring students' work and providing corrective evaluations on their investigations. Additionally, the science teacher suggested that the poster on digestive disorders in the LKPD be replaced with a poster on how to overcome digestive system disorders or group presentations on different types of disorders. Furthermore, the science teacher recommended that the implementation of the LKPD be continuous to support science learning in other topics.

The readability test with students averaged 84.46%, which is considered very valid for use. Regarding content, there were statements with relatively lower results compared to others, specifically the second statement with a result of 80.56% and the third statement with 80.32%. This is due to a lack of discussion about phenomena in the LKPD that relate to the students' surroundings, making the presented phenomena seem unfamiliar to them. Additionally, some instructions in the LKPD were unclear and difficult to understand. This contradicts Sihombing & Widiastuti, (2021), who state that instructions in the LKPD must be clear and easy to understand to avoid misunderstandings when completing the LKPD.

In terms of language, the average score for this aspect was 84.49%, which is valid, indicating that the language and sentences used in the LKPD are easy to understand. For the aspect of utilization, the average score for each aspect was 87.42%, which is considered very valid. This aligns with Prastowo (2015), who states that one of the purposes of the LKPD is to facilitate students' understanding of the material provided by the teacher. In terms of presentation and graphics, the average score for each aspect was 83.61%, which is considered very valid. This readability test is crucial in the development of a medium, as it helps describe students' perceptions of the developed product, ensuring it meets their needs in its use (Utami et al., 2022).

Product Results Discussion

The product resulting from this research is an LKPD (Student Worksheet) applied to the digestive system material. The activities in this LKPD are based on problems occurring in the surrounding environment. According to Gorghiu et al., (2015), problems based on real life will motivate students to actively engage in analyzing the discussed issues. This problem-based LKPD product is designed into three parts on the subtopics of nutrition, additives, and disorders in the digestive system. On the first page, there is a cover tailored to the topic to be discussed, which can help students understand the topic being studied. Additionally, the LKPD cover is designed with several images to attract students to study the material, and it includes student identification, the title, and subtopics.

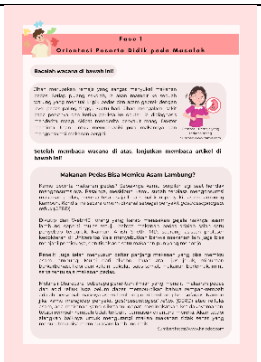
Figure 2. The Cover Display of the Student LKPD
Source: (Personal document, 2024)

On the second page, there are explanations about the use of worksheets (LKPD), learning outcomes, and learning objectives. The purpose of this page is to inform students about how to use the worksheets, the learning outcomes they will achieve, and the learning objectives of the worksheets. On the next page, there is an introduction containing a brief overview of the subject to be studied. This is intended so that students can get an idea of the topics that will be covered in the worksheets.

The developed worksheets (LKPD) consist of five phases based on Arends (2012) statement, which involve directing the problem to students, organizing students to understand the problem and think about solutions. This includes supporting independent and group observations, developing and presenting solutions, as well as analyze and evaluate the problem-solving process. In the first phase activities, problems are presented in the form of articles, discourse, and several questions related to the problems to be discussed. The issues presented in each LKPD are as follows.

Table 10. Phenomena or Issues in LKPD
Source: Personal Document (2024)

No.	Illustration of Problem Based Learning (PBL) based LKPD	Activities in Problem Based Learning (PBL) in LKPD
1.		In the nutrition subtopic, a problem is presented regarding foods labeled as natural and healthy, questioning whether they are truly healthy or not. Phase 1 involves orienting students to the problem by presenting an article that provides an overview of the issue to be discussed. Additionally, during this phase, the problem statement is formulated to spark discussions. Phase 2 focuses on organizing students for learning by directing them to gather in groups and prepare for their investigation. Phase 3, which guides the investigation, involves researching to answer the questions posed by the problem statement. This investigation includes examining the nutritional content and total calories found in packaging of foods labeled as healthy/natural. Phase 4, centered on developing and presenting the work, involves recording observations in a table provided in the LKPD. Phase 5, analyzing and evaluating the problem-solving process, includes discussing questions related to the issue. Subsequently, conclusions are drawn based on the investigation of the problem.
2.		In the LKPD for the subtopic of food additives, the problem presented concerns the potential danger of consuming instant noodles and soda simultaneously, which can lead to stomach ache. Phase 1 involves orienting students to the problem by presenting an article that gives an overview of the issue to be discussed. Additionally, a problem statement is provided during this phase to stimulate discussion. Phase 2 focuses on organizing students for learning by directing them to gather in groups and prepare for their investigation. Phase 3, which guides the investigation, involves researching to answer the questions posed by the problem statement. This investigation includes examining the additives present in the packaging of instant noodles and canned soda, as well as investigating their functions and the impacts they have on the body. Phase 4, centered on developing and presenting the work, involves recording observations in a table provided in the LKPD. Phase 5, analyzing and evaluating the problem-solving process, includes discussing questions related to the issue. Subsequently, conclusions are drawn based on the investigation of the problem. This structured approach in the LKPD aims to engage students actively in understanding the potential risks associated with simultaneous

		consumption of instant noodles and soda, and to evaluate the findings critically.
3.		In the LKPD for the subtopic of digestive disorders, a problem is presented involving a child suffering from gastritis due to frequent consumption of spicy foods. Phase 1 involves orienting students to the problem by presenting an article and discourse that provide an overview of the issue to be discussed. Additionally, a problem statement is provided during this phase to stimulate discussion. Phase 2 focuses on organizing students for learning by directing them to gather in groups and prepare for their investigation. Phase 3, which guides the investigation, involves researching to answer the questions posed by the problem statement. This investigation includes studying references on a balanced and healthy diet to prevent gastritis, which are available in the form of videos and articles accessible via barcode. Phase 4, centered on developing and presenting the work, involves recording observations in a table provided in the LKPD. Phase 5, analyzing and evaluating the problem-solving process, includes discussing the preparation and creation of a poster that will be presented. This structured approach in the LKPD aims to engage students actively in understanding the causes and preventive measures of gastritis due to dietary habits, encouraging critical analysis and presentation skills.

The advantages of this problem-based LKPD development include adding variety to the teaching materials used by educators, who can now utilize not only worksheets or textbooks but also these problem-based worksheets. Additionally, the existence of these LKPDs transforms students from passive learners into active participants, as the learning process centers around the students, with the teacher acting as a facilitator who monitors their progress.

CONCLUSION AND RECOMMENDATIONS

A. Conclusion

Based on the research results regarding the developed product, it can be concluded that the developed PBL-based LKPD for the digestive system material is highly valid and practical for educational use, with media validation at 95.24%, material validation at 87.78%, practicality at 90.16%, and readability at 84.46%.

B. Recommendation

Future research should extend to the implementation stage of the ADDIE model to assess the LKPD's effectiveness in real classroom settings. Additionally, developing PBL-based LKPD for other subjects could further enhance student engagement and learning outcomes.

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