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DEVELOPMENT OF PBL MODEL-BASED STUDENTS' WORKSHEET TO IMPROVE STUDENTS' CRITICAL THINKING SKILL IN PHASE C

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PENGEMBANGAN LKPD BERBASIS MODEL PBL UNTUK MENINGKATKAN KEMAMPUAN BERPIKIR KRITIS SISWA DI FASE C

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ABSTRACT

Abstract: *Critical thinking skill is a skill that students need to have in the 21st century. When students have critical thinking skills, they are expected to be able to seriously understand, analyze, and process the information before making a decision. The research objective is to improve students' critical thinking skills through PBL-based worksheets on the subject of the human digestive system. This LKPD product was developed using the ADDIE model, which was tested at MIN 2 West Lampung. As many as 15 students were in the control class and 25 students were in the experimental class. The research results indicate that the validated LKPD based on the validity test analysis using Aiken reveals a score of 0.8210 in the valid category. The analysis of the practicality test indicates 85% for educators and 88% for students, both are in the very practical category. The product effectiveness analysis reveals an average pre-test score of 58.4 and an average post-test score of 83.2. The development of worksheets based on the PBL model has a significant influence on students' critical thinking skills.*

Keywords: students' critical thinking, PBL model, students' worksheet development

Abstrak: Kemampuan berpikir kritis adalah kemampuan yang perlu dimiliki oleh peserta didik pada abad 21. Peserta didik ketika memiliki kemampuan berpikir kritis, mereka diharapkan mampu memahami, menganalisis,hingga mengolah informasi dengan sungguh-sungguh sebelum memutuskan keputusan. Tujuan penelitian ialah untuk meningkatkan kemampuan berpikir kritis peserta didik melalui LKPD berbasis PBL pada materi sistem pencernaan manusia. Pengembangan produk LKPD ini menggunakan model ADDIE, yang diujicobakan di MIN 2 Lampung Barat. Sebanyak 15 peserta didik berada dalam kelas kontrol dan 25 peserta didik dalam kelas eksperimen. Hasil penelitian menunjukkan bahwasanya LKPD tervalidasi berdasarkan analisis uji validitas menggunakan Aiken menghasilkan angka 0,8210 termasuk ke dalam kategori Valid. Analisis uji praktikalitas pendidik menghasilkan 85% dan peserta didik 88%, keduanya berada pada kategori sangat praktis. Analisis efektivitas produk menghasilkan nilai rata-rata pre-test 58.4 dan rata-rata post-test 83.2. Pengembangan LKPD berbasis model PBL memiliki pengaruh yang cukup signifikan terhadap kemampuan berpikir kritis peserta didik.

Kata Kunci: berpikir kritis siswa, model PBL, pengembangan LKPD

CITATION

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INTRODUCTION

Learners are expected to have the 4C abilities, namely Collaborative, Critical thinking, Communication, and Creative, in order to develop life skills and soft skills in 21st-century education (Istiqah et al., 2021). When students possess critical thinking skills, they are required to comprehend, scrutinize, and thoughtfully process information before arriving at a decision (Sanjaya & Ratnasari, 2021). Critical thinking is the skill of analyzing and evaluating data, posing important and unambiguous questions and issues, collecting and assessing significant information, employing abstract concepts, exhibiting open-mindedness, and communicating effectively (Nuryanti, 2021; Adhitya et al., 2023).

Facione (1990) identifies six indicators of critical thinking that can be attained, as follows: (1) *Interpretation*, is the process of comprehending and conveying the significance of experiences, situations, data, evaluations, rules, procedures, and criteria, (2) *Analysis*, is commonly regarded as the process of identifying desirable and appropriate inferences in reality, (3) *Inference*, involves identifying the necessary elements to draw a logical conclusion and carefully considering relevant information, (4) *Evaluation*, is the process of assessing the credibility of a statement that is both logical and shows elements of connectedness, (5) *Explanation*, involves justifying the reasoning behind the results through persuasive arguments, and (6) *Self-regulation*, involves reviewing one's cognitive performance through analytical and evaluative skills when making inferences, evaluations, and regulating oneself.

The Problem Based Learning (PBL) model presents pertinent real-world problems as a framework for developing critical thinking and problem-solving skills while building knowledge (Istiqah et al., 2021). Properly designed and implemented PBL syntax should encourage critical thinking. PBL provides authentic experiences, constructs knowledge, and integrates real-life problems with learning to promote independent problem-solving (Akcay, 2009).

One way to integrate critical thinking indicators is through PBL syntax, specifically: 1) problem orientation, is the initial stage of PBL and integrates the interpretation indicator in critical thinking through understanding, 2) organizing learners, integrated in the analysis indicator through the introduction of concepts, 3) group investigations can help train critical thinking skills by teaching the ability to draw conclusions and assess information obtained through inference, 4) developing and producing work can train critical thinking skills in the form of skills by giving the right statement, 5) analyze and evaluate the results of problem solving through cognitive observation one is able to practice self-regulation (Sanjaya & Ratnasari, 2021).

The PBL model, aimed at enhancing critical thinking skills, can be employed for teaching the human digestive system. The rationales for selecting the human digestive system as material are: (1) *Programme for International Student Assessment* (PISA) contains the three dimensions of science (process, content, and application context) (OECD, 2018). In its development, PISA categorizes science into four dimensions: process, content, application context, and attitude. All of these dimensions are interconnected, and the human digestive system is one of the discussed contexts. (Wildana et al., 2023), (2) The human digestive system is a topic that should be taught in the IPAS phase C course of the independent curriculum, (3) In CP of phase C, students can learn about the human digestive system and understand the disorders associated with it. This includes efforts to maintain a healthy digestive system, which can help address real-world problems affecting students in their daily lives (Istiqah et al., 2021).

When studying the digestive system,

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learning activities should be supported with helpful teaching materials, like Learner Worksheets, designed to guide students in critical thinking using the PBL syntax found in the student worksheet (Astuti et al., 2018). Worksheets designed for learners can assist in facilitating student-centered learning (SCL) when discussing human digestive system material (Husni et al., 2020). A persistent issue is that educators seldom create learner worksheets tailored to students' needs, especially those targeting competence enhancement. Critical thinking skills are crucial for comprehending human digestive system concepts, thus necessitating the creation of PBL-based learner worksheets (Setiawan et al., 2022), This research aims to develop learner worksheets that assist students in comprehending the human digestive system and gaining opportunities to enhance their critical thinking abilities through PBL syntax (Sanjaya & Ratnasari, 2021).

METHOD

The product development underwent testing from May 6-16, 2023 on fifth-grade students at MIN 2 West Lampung. There was one control class with 15 students and one experimental class with 25 students. The product, in the form of the LKPD, aims to enhance critical thinking skills by using critical thinking indicators according to Facione, which includes interpretation, analysis, evaluation, inference, explanation, and self-regulation (Basri et al., 2019). This study pertains to product development that utilizes the ADDIE model (*Analysis, Design, Development, Implementation, and Evaluation*) (Hadhiedae et al., 2021; Branch, 2009).

The analysis phase examines field issues and the requirements of students and educators (Spatioti et al., 2022). Theoretical studies are needed to review the concept related to Learner Worksheets. For instance, analyzing the Learning Outcomes (CP) would help in describing them in the appropriate Learning Objective Flow (ATP) of human digestive system materials. The analysis of the performance of teaching materials, including Learner Worksheets, in learning is necessary. This should include fact, concept, principle, and learning procedure material analyses. Also, understanding the relationship between the syntax of the PBL model and the critical thinking indicators that have been adjusted is important (Cahyadi, 2019). The analysis stage is essential as it serves as a reference point or foundation to determine the subsequent steps (Apriliani & Radia, 2020).

The design phase, at the design stage of this research, student worksheet is used as a teaching material for the human digestive system to enhance students' critical thinking skills. Moreover, prior research has consistently demonstrated that learning with PBL-based student worksheet can effectively enhance critical thinking skills of students. In order to prevent passive learning attitudes and attract learners' interest, this study implements a problem-based learning model. As a result, learners will play an essential role in the continuity of the learning process during core activities (Najwa Nurfajriah et al., 2023). The teaching materials are designed as student worksheets. Activities involve collecting necessary material for the human digestive system from various sources, including relevant images, audio or video, and software used for designing student worksheets (Tegeh & Kirna, 2013).

The development product phase, it undergoes expert validation (extended judgment). Nine validators, including three material, three media, and three language experts, were involved in developing this LKPD. The results of the assessments from the nine validators will be analyzed using Aiken's (1985) validity test data analysis method. The objective goal is to promote mutual understanding among validators (Yuh-Tyng Chen, 2012), the formula is utilized:

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$$V = \frac{\sum_{i=1}^{n} s_n}{n(c-1)}$$

Table 1 provides the Aiken index scale range for measuring the agreement between validators, which can determine the level of validity (Aiken, 1985).

Table 1. Interpreting the Validity Index Value

Range of the Aiken Index Scale	Description
$V > 0{,}84$	Very Valid
$V > 0{,}68 – 0{,}84$	Valid
$V > 0{,}52 – 0{,}68$	Fair
$V > 0{,}36 – 0{,}52$	Less Valid
$V \leq 0{,}36$	Invalid

The implementation phase, which aims to apply the results of this student worksheet, will be tested on fifth-grade students at MIN 2 West Lampung. It will be applied to the control class with 15 students. The results will be subjected to a practicality test analysis. The prototype will be used by students and teachers. Using the mean formula, the practicality test results can indicate the feasibility of utilizing PBL model-based learner worksheets. This assessment employs a Likert scale calculation, and the results can determine the feasibility category according to Table 2 (Purwanto, 2013).

Table 2. Feasibility Categories Based on The Assessment of Practicality

Feasibility Categories	Category
80%, x ≤ 100%	Very Practical
60%, x ≤ 80%	Practical
40%, x ≤ 60%	Fair
20%, x ≤ 40%	Less Practical
0%, x ≤ 20%	Not Practical

The evaluation phase, which follows the implementation activities, aims to measure the success of developing student worksheet based on the PBL model in enhancing students' critical thinking skills (Astuti et al., 2018). Both the advantages and shortcomings will be used as evaluation results to improve this learner worksheet product. The analysis of data from product effectiveness tests should include pre-test and post-test questions for the students (Samboteng et al., 2023). The results will serve as a reference for evaluating the growth and development of students' critical thinking skills while using the student worksheet. The following formula was utilized:

$$\frac{(\%\ rata-rata\ posttest)-(\%rata-rata\ pretest)}{100-\%rata-rata\ pretes}$$

The obtained value shall be adjusted to the N-gain category, as per the criteria explained in Table 3 (Ningsih et al., 2022).

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Table 3. Criteria of N-gain

Criteria of N-Gain	Standardized value
g-High	$g \geq 0,7$
g-Medium	$0,7 > g \geq 0,3$
g-Low	$g < 0,3$

RESULT AND DISCUSSION

Result

The focus of 21st-century learning is on learners, who are expected to possess competencies, such as the ability to think critically. To achieve this, it is necessary to adopt a learning model that supports Student-Centered Learning (SCL). The Problem Based Learning (PBL) model is believed to promote active learning among students. (Hung et al., 2007). To implement this PBL model, appropriate teaching materials are required to support learning. One such material is the Learner Worksheet. Therefore, the development of PBL model-based worksheets to enhance students' critical thinking skills, using the ADDIE model, should undergo five stages (Diana et al., 2022).

Based on the analysis of students' and teachers' needs, it is necessary to provide instructional materials in the form of student worksheets to direct learning towards student-centered learning (SCL) and to enhance students' thinking skills. This is supported by extensive literature that emphasizes the need for student worksheets to support the learning process (Wijayanti et al., 2022). The student worksheets, based on the PBL model, are designed to achieve learning outcomes (CP) and facilitate the flow of learning objectives (ATP). (Yew & Goh, 2016).

Table 4. Syntax of PBL and The Activities

Syntax of PBL	Activities	Cite's
Problem Oriented	The problems discussed in this learning activity are closely related to the human digestive system, and learners are expected to gain in-depth understanding through relevant examples.	Vera & Wardani, (2018), Febrita & Harni (2020)
Organized Students	Students can classify the topics presented in the human digestive system materials.	Saputra (2015), Darti (2023)
Investigations Guide as Group	Students conduct group experiments in an organized manner to comprehend and evaluate the presented issues and potential solutions pertaining to the human digestive system material.	Agustina et al (2022), Pribadi et al (2021)
Presentations of Result	The groups of learners will present their answers on the worksheets provided, and these will be discussed at the end of the lesson.	Oktavi & Taufina (2020), Adiwiguna et al. (2019)
Analysation and Evaluation	Students can do analysis and evaluation of their group problem solving techniques for accurate conclusions.	Nurkhasanah et al (2019)

The design phase involves creating a prototype using the Canva Pro application. This includes determining the template, colors, type of writing, and images that support and match the material. The prototype design underwent some changes based on personal judgment, such as removing distracting background images, replacing inappropriate typography, and correcting inappropriate color choices.

In this phase, some improvements were made based on the suggestions of the validators, both material, media and language validators. The improvements started with the

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cover of the learner worksheet, which all used the number five to explain the grade level, but was changed to C as the Merdeka Curriculum uses phase division for grade levels. Then the flow of learning objectives is focused on the material about disorders of the human digestive system. The concept map is also improved to make the flow clearer. The rest, the use of excessive images, the use of inappropriate diction, and errors in writing were also corrected, resulting in the final design as shown in Figure 1.

Figure 1. Desain of student worksheet based on PBL model

During the development phase, feasibility was measured on the basis of the validator's assessment, and the results were then analyzed in accordance with Aiken's (1985) method and with reference to Table 1 for the level of validity:

Table 5. Validation Test Results by Experts Using Aiken Analysis

Aspect of Material Assesment	Aiken' V (Aspect of Material)	Aspect of Media Assesment	Aiken' V (Aspect of Media)	Aspect of Language	Aiken' V (Aspect of Language)
Eligibility of Content	0.7375	Size of Model	0.7500	Straighforward	0.8889
Feasibility of Presentatation	0.8333	Design of Cover	0.7976	Communicative	0.8333
Relevance to PBL Model	0.7917	Design of Content	0.7333	Dialogical and Interactive	1
				Suitable for Learners	0.9583
				Conforms to Languange rules	0.8958

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Assesment of Material (Holistic)	0.7875	Assesment of Media (Holistic)	0.7603	Assesment of Language (Holistic)	0.9153

The validity test, conducted by nine validators, indicates that the material assessment aspect has an average score of 0.7875, putting it in the 'Valid' category according to the designated criteria (Suhardi, 2022). The media evaluation aspect produces an average of 0.7603, which is in the "Valid" category, while for the language evaluation aspect it shows an average of 0.9153, which is classified in the "Very Valid" category, as the category determined from Table 1, this proves that the feasibility test of the learner worksheet through the expert validation stage is included in the "Valid" category (Aiken, 1985). Figure 2 displays the expert validation test in a graphic image.

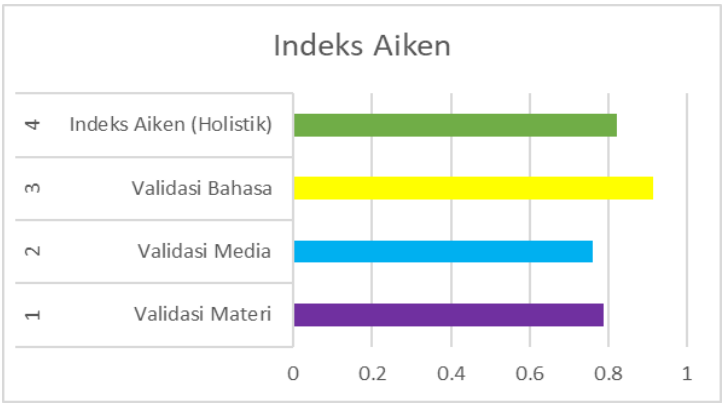

Figure 2. Aiken Holistic Index Chart

According to the graph, linguist validation has the highest value, while media validation has the lowest value compared to other expert validations. Consequently, the overall Aiken Index results in 0.8210. This figure indicates that the results of expert validation fall under the "Valid" category. Table 1 serves as the determinant for this classification (Aiken, 1985).

The implementation phase, the learner worksheets were tested on the control group consisting of 15 students, and three educators evaluated the worksheets. The practicality of the student worksheets was evaluated based on the results of the assessment from both students and educators.

Table 6. Practicality Results

No.	Aspect	Praktikalitas		Category
		Teacher	Student	
1.	Display of Student Worksheet	83%	86%	Very Practical
2.	Suitability of Materials	84%	89%	Very Practical
3.	Suitaility of Language	85%	89%	Very Practical
Overall Average		**85%**	**88%**	**Very Practical**

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Table 2 shows the categorization, the results of the practicality assessment by educators indicate that 85% found the model "Very Practical". Similarly, 88% deemed it "Very Practical" according to student feedback. Based on this, the PBL model-based student worksheet to improve critical thinking skills in the control class is considered "Very Practical" and can be continued in the next phase.

The evaluation phase, the LKPD was tested on the experimental class, consisting of 25 students. The notable difference is the inclusion of pre-test and post-test assessments, which help to observe improvement in critical thinking skills before and after the student worksheet is provided. Initially, the pre-test assessment is conducted, followed by the provision of the student worksheet. After the worksheet is administered, the post-test is carried out to evaluate the effectiveness of the worksheet in improving critical thinking skills (Movva et al., 2022).

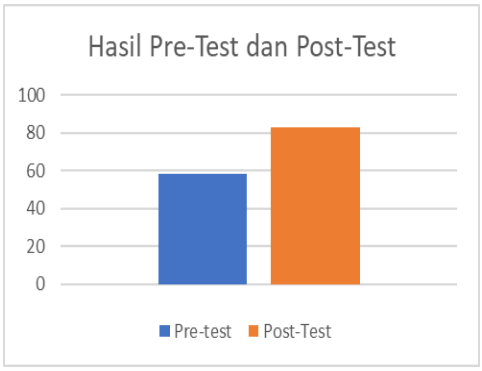

Figure 3. A Comparison of results between pre-test and post-test

The N-gain is calculated as a percentage using a specific formula. The findings are then presented and elaborated in Table 7.

Table 7. Results from the pre-test and post-test

No.	Effectiveness Testing	Result	N-gain Score	N-gain Score %	Criteria	Category
1.	Pre-Test	58.4	0.56	56%	g-Medium	Sufficiently effective
2.	Post-Test	83.2				

The results of the pre-test and post-test assessments showed an increase after the application of a treatment, specifically the utilization of student worksheets (Anazifa & Djukri, 2017). When analyzed using N-gain, this study satisfies the 'medium' criteria and demonstrates a significant effect of PBL model-based student worksheets on students' critical thinking skills (Agustina et al., 2022). This is supported by the N-gain score of 0.56, representing a 56% increase in knowledge. The categorization was expanded into five categories, revealing the results as displayed in Table 8 (Azwar, 2022).

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Table 8. Classification Based on Pre-Test and Post-Test Results

Category	Criteria	Mean	SD	Substitution	Pre-Test	Post-Test
Very Low	$X \leq M - 1.5SD$			$X \leq 42.89$	2	0
Low	$M - 1.5SD < X \leq M - 0.5SD$			$61.50 < X \leq 42.89$	2	0
Fair	$M - 0.5SD < X \leq M + 0.5SD$	70.8	18.6	$80.10 < X \leq 61.50$	18	2
High	$M + 0.5SD < X \leq M + 1.5SD$			$98.71 < X \leq 80.10$	2	17
Very High	$M + 1.5SD < X$			$98.71 < X$	1	6

Table 8 shows that in the post-test results, no learners fall into the low or very low categories, while in the pre-test, students are spread across all five categories. During the pre-test, the "Fair" category was dominant, while the "High" category was dominant during the post-test. Before treatment in the form of a student worksheet, there was only one learner in the "Very High" category during the pre-test. After the treatment, the number of learners increased to six in this category. It has been demonstrated that learner worksheets can improve students' critical thinking skills.

The problem-based learning (PBL) model incorporates critical thinking skills as defined by Facione (Seventika, 2022), Mapping these indicators along with the PBL model results in the depiction provided by Table 9.

Table 9. The Mapping of an Integrated Problem-Based Learning Model with Critical Thinking Skills

Syntax of PBL	Indicator of Critical Thinking
Problem Oriented	Interpretation
Organized Students	Analysis
Investigations Guide as Group	Evaluation
	Inference
Presentations of Result	Explanation
Analysation and Evaluation	Self-Regulation

Table 9 shows that the integration of problem-based learning (PBL) syntax and critical thinking indicators requires students to possess interpretation skills for problem orientation. This involves understanding information as an initial stimulus (Najwa Nurfajriah et al., 2023). Identifying a concept can pass on indicators of analytical skills to learners through syntax organization (Astuti et al., 2018). In the syntax of guiding group investigations, learners are required to assess and summarize information obtained from data. In the syntax of developing and presenting work results, students can practice their skills by presenting their opinions in detail and with precision (Adiwiguna et al., 2019). The final step in PBL involves analyzing and evaluating the results of problem-solving. By doing so, students can self-regulate by reviewing the answers or arguments they presented in the earlier steps (Adiwiguna et al., 2019). Table 10 presents the results of the implemented mapping.

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Table 10. Results of Using Student Worksheet in Group

Indicator of Critical Thinking	Group 1	Group 2	Group 3	Group 4	Group 5
Interpretation	4	4	4	4	4
Analysis	4	4	4	4	4
Evaluation Inference	4	4	4	4	4
Explanation	2	3	3	4	3
Self-Regulation	2	2	3	3	3
Rata-Rata	80	85	90	95	90

The implementation of PBL-based student worksheets on human digestive system for five groups of students resulted in achieving a score ≥ 80 in each critical thinking indicator. Therefore, it can be concluded that the product development of these worksheets is capable of achieving a good category of critical thinking skills (Sitopu & Purba, 2021; Rizky et al., 2022; Hartati, 2022), even though group 1 found two indicators challenging.

Figure 3. PBL syntax integrated in explanation and self-regulation indicators

Group 1 learners find it challenging to express their arguments in detail and with precision using the explanation indicators provided on their worksheets for analyzing and producing work. However, these learners are able to achieve good ratings in each category for identifying problems, observing phenomena, and determining the results of their observations.

Discussion

The results of the development of PBL model-based student worksheets for improving critical thinking skills in Phase C of fifth-grade learning at MIN 2 West Lampung have been reported. The worksheets have been tested for validity, practicality, and effectiveness. Some important points were identified in the findings from the needs analysis stage, including: 1) The teaching materials used in learning have not been directed towards Student Centered Learning (SCL), according to the literature analysis conducted by Saputra (2015); Darti (2023); Agustina et al (2022); Pribadi et al (2021), student-centered learning settings can offer valuable experiences and enable students to develop critical thinking skills, 2) A handbook or worksheet for students can help learners and educators in their learning process. According to the study, student

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worksheets are necessary teaching materials to support the learning process (Wijayanti et al., 2022).

The feasibility test of the PBL model-based LKPD prototype demonstrated validity in the areas of content, material, and media. Additionally, a high level of validity was obtained in the language aspect. Based on the aforementioned findings, the feasibility of the PBL model-based LKPD prototype in the areas of content and media can be assessed. The feasibility of the content by Ramadhan, et al (2019); Oktavi, W., & Taufina, T. (2020) and Nurkhasanah, D., Wahyudi, & Indarini, (2019) the text suggests that the inclusion of feasible content in teaching materials can aid in students' comprehensive understanding of the material.

After meeting the feasibility criteria based on material, media, and language aspects, the prototype was tested to determine its practicality. The trial included 15 students in a control group. The results indicated that the appearance of the student worksheet, the suitability of the material, and the suitability of the language used by the educator resulted in a rating of 85% in all aspects and a holistic rating of 88% indicating that the prototype of the student worksheet is highly practical. The results of practicality testing indicated that the prototype is highly practical. The results refer to the extent to which users find the prototype attractive and can use it in normal learning conditions (Fauzan et al., 2013).

The study aimed to investigate the impact of implementing PBL model-based student worksheets on improving students' critical thinking skills in phase C of the human digestive system material. The study findings indicated a notable increase in critical thinking skills with the average pre-test score of 58.4 increasing to 83.2 for the post-test. Additionally, the results show that the number of students who scored high category in critical thinking skills increased dramatically from 2 students in the pre-test to 17 in the post-test, while in the very high category, the increase was from 1 student in the pre-test to 6 students in the post-test. This indicates a significant improvement in students' critical thinking abilities after using the student worksheets (Sanjaya & Ratnasari, 2021).

Several commitments, including problem orientation in learning, may trigger the improvement of students' critical thinking skills in this study. The implementation of problem orientation on the students' worksheets aligns with the problems faced by students on a daily basis, research's by Vera & Wardani, (2018); Febrita & Harni (2020) it is asserted that a problem-oriented approach can enable students to acquire a profound understanding of the subject matter by engaging with relevant examples related to the material being taught, 2) The process of conditioning students to investigate existing problems to find solutions and present them in the form of a final decision on the problem involves organizing and presenting the results of their investigations in learning, as the results of research from Saputra (2015); Darti (2023); Agustina et al (2022); Pribadi et al (2021); Oktavi & Taufina (2020); Adiwiguna et al. (2019) According to this theory, learners engage in problem discussion to comprehend and evaluate the problem, then present the findings as a means of problem-solving, 3) Analyzing and evaluating is an activity that involves critical thinking by students regarding problem-solving efforts, after conducting the investigation by Nurkhasanah et al (2019) it was noted that this activity is helpful in analyzing and evaluating the outcomes of problem-solving which has been conducted to determine its accuracy.

CONCLUSION AND RECOMMENDATION

This study involves product development using the ADDIE (Rajapboyevna & Umarjonovna, 2022), The study revealed that the Lesson Plan and Student Worksheets (LKPD) based on Problem-Based Learning (PBL) approach when applied to the topic of human digestive system enhances the cognitive abilities of students (Murtavia et al., 2022).

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The validity of this student worksheet was assessed by experts in material, media, and language, evaluating all feasibility indicators in LKPD. The Aiken's analysis overall average score was 0.8210, including the category "Valid", indicating that the student worksheet is appropriate for use (Juniar Maulani, 2022). The analysis results for educator and student practicality were 85% and 88%, respectively. Both results belong to the "Very Practical" category. Product effectiveness analysis is supported by the pre-test and post-test results (Winarti et al., 2022), which shows an increase of 24.8. The N-gain score results exhibit 0.56 or 56 percent, including the criteria "Medium" and category "Sufficiently Effective", indicating a significant impact of using PBL model-based student worksheets on students' critical thinking skills (Munawaroh et al., 2022).

Further research should consider the stages of analyzing, designing, developing, revising, and implementing student worksheets on the human digestive system material for educators and students. Using the Problem-Based Learning (PBL) model requires integrating each syntax with learning activities to enable students to sustainably solve problems and make decisions with positive impacts. (Filho et al., 2020). Additionally, future research may develop additional teaching resources, including modules that can be incorporated into critical thinking metrics.

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