PILLAR OF PHYSICS EDUCATION
Vol. 19 (4), 2026, pp.401-411
ISSN (Print) : 2337-9618
ISSN (Online) : 2684-8880

NEEDS ANALYSIS FOR THE DEVELOPMENT OF A PROBLEM-BASED LEARNING AND LOCAL WISDOM BASED E-LKPD ON STATIC FLUIDS TO FACILITATE STUDENTS' CRITICAL THINKING SKILLS

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ABSTRACT

Critical thinking skills are essential in physics education. This study aimed to analyze initial learning conditions and student needs as a basis for designing a static fluid electronic student worksheet (E-LKPD) integrating Problem-Based Learning (PBL) and local wisdom, with Canva AI supporting its visual design, to facilitate students' critical thinking skills. The study employed descriptive qualitative and quantitative methods in the Define phase of the 4-D development model, involving initial, student, task, and concept analyses, as well as the formulation of learning objectives. Participants included 30 Grade XI Phase F students and one physics teacher at SMA Negeri 1 Lunang. Data were collected through teacher interviews, student needs questionnaires, and an initial critical thinking test, then analyzed descriptively and using percentages. The initial test showed that students' critical thinking skills were low, with an average percentage of 31.08%; self-regulation had the lowest percentage 24.16%. Although students showed strong interest in physics and readiness to use digital devices, existing learning materials had not optimally integrated interactive digital learning, local wisdom, and activities addressing all six critical thinking indicators. These findings indicate the need for an E-LKPD that combines contextual problems rooted in local wisdom, PBL learning stages, and Canva AI-supported visual design. The study's specific contribution is a needs-based design foundation that aligns local contexts, PBL activities, and visual learning resources with the six indicators of critical thinking skills.

Keywords : Electronic Student Worksheet(e-lkpd), Problem Based Learning, Local Wisdom, Static Fluids, Citical Thinking Skills.

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I. INTRODUCTION

Twenty-first-century physics education emphasizes not only conceptual mastery but also the development of higher-order thinking skills, including critical thinking. These skills enable students to interpret information, analyze relationships between concepts, evaluate evidence, draw conclusions, and make logical decisions [1], [2]. In physics learning, critical thinking is important because students need to connect scientific concepts with phenomena and problems encountered in everyday life [3], [4]. In line with the Phase F Physics Learning Outcomes, students are expected to analyze physics concepts and produce work demonstrating the application of fluid laws in daily life. This study adopts six critical thinking indicators: interpretation, analysis, evaluation, inference, explanation, and self-regulation [5]. Therefore, physics instruction should provide structured learning activities that allow students to practice all six indicators.

Problem-Based Learning (PBL) is one instructional model that can facilitate critical thinking. It uses problems as the starting point for learning and guides students through problem identification, learning organization, investigation, solution development, and evaluation of the problem-solving process [6], [7]. Previous studies have indicated that PBL can support problem-solving and critical thinking in physics education [8], [9]. However, its implementation requires teaching materials that translate each PBL stage into structured student activities. Electronic student worksheets (E-LKPD) can support this process by presenting learning materials,

visualizations, instructions, questions, and investigations in a digital format [11]-[14]. Previous research on PBL-based E-LKPDs has highlighted the need for electronic materials that promote active student engagement [29], while worksheet development for fluid topics has also targeted the development of students' critical thinking skills [30]. Nevertheless, the potential of an E-LKPD depends not merely on its digital format but also on the integration of PBL stages, contextual problems, and critical thinking indicators throughout its learning activities.

Problems connected to students' everyday experiences can make physics learning more meaningful. Local wisdom provides opportunities to connect physics concepts with the environment, culture, and community activities [17]–[19]. In South Pesisir, particularly Lunang, coastal activities such as using fishing boats and fishing nets can provide learning contexts for discussing buoyancy, Archimedes' principle, and the interaction between objects and fluids. The use of local water resources may also provide relevant contexts for exploring static fluid concepts. These contexts should be developed into problems that students must analyze and investigate rather than presented merely as illustrations. In this way, local wisdom serves as a starting point for PBL investigations and connects static fluid concepts with students' real-life experiences.

In addition to the instructional model and local context, digital teaching materials require clear visual communication and well-organized information. Canva AI was selected as a design-support tool because it can assist in creating visual elements, illustrations, and layouts for digital learning materials [20]–[23]. In this study, its role is limited to supporting the visual design and presentation of the E-LKPD so that contextual problems, investigation instructions, and learning activities are organized clearly. Canva AI does not determine the PBL stages or replace the need for scientific accuracy; all generated text, visuals, and activities must be selected and reviewed by the developers. Thus, Canva AI supports the visual design process, while the instructional structure is determined by PBL, local wisdom integration, and the six critical thinking indicators.

A preliminary study at SMA Negeri 1 Lunang revealed that 30 Grade XI Phase F students achieved an average critical thinking percentage of 31.08% on the initial test, with self-regulation recording the lowest percentage at 24.16%. Existing learning materials were dominated by textbooks and worksheets, while interactive digital materials integrating PBL and local wisdom had not been optimally utilized. These findings indicate a gap between the expectation that students actively analyze and solve problems and the learning-material support available to them. Previous studies have examined PBL, E-LKPDs, local wisdom, and Canva-assisted learning media; however, this study focuses on a needs-based design for a static fluid E-LKPD that integrates PBL stages, Lunang local wisdom, Canva AI-supported visual design, and all six critical thinking indicators within a unified instructional framework. Its specific contribution is to establish a design foundation that connects student characteristics, learning needs, local contexts, and critical thinking activities before product development. Therefore, this study aims to analyze the design needs for a static fluid E-LKPD integrating PBL and local wisdom, with Canva AI supporting its visual design, to facilitate the critical thinking skills of Grade XI Phase F students at SMA Negeri 1 Lunang..

II. METHOD

This study is part of a research and development project aimed at producing a static fluid electronic student worksheet (E-LKPD) based on Problem-Based Learning (PBL) and local wisdom, with Canva AI supporting its visual design, to facilitate students' critical thinking skills. The development follows the 4-D model (*Define, Design, Develop,* and *Disseminate*) proposed by Thiagarajan et al. [24]. This article specifically reports the needs analysis conducted during the *Define* phase as the basis for determining the characteristics and design of the proposed E-LKPD. Accordingly, the article focuses on the initial analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives rather than reporting the results of the *Develop* phase.

The study was conducted at SMA Negeri 1 Lunang, South Pesisir Regency, during the 2025/2026 academic year. The participants consisted of 30 Grade XI Phase F students and one physics teacher. The students were selected because they represented the intended users of the E-LKPD for the static fluid topic, while the physics teacher was included because of their direct experience in classroom instruction and the use of learning materials. Participant selection was based on their relevance to the needs analysis and the instructional context under investigation.

The needs analysis involved five activities in the *Define* phase: initial analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives. Initial analysis was conducted through an interview with the physics teacher to obtain information about the curriculum, learning materials, teaching resources, instructional practices, technology use, and the need for E-LKPD development. Student analysis used a questionnaire to identify students' characteristics, interests, readiness to use digital devices, and needs for digital learning materials. An

initial critical thinking test was administered to describe students' abilities across six indicators: interpretation, analysis, evaluation, inference, explanation, and self-regulation. Task and concept analyses were then conducted to determine the learning activities and the scope of static fluid content, including hydrostatic pressure, Archimedes' principle, Pascal's law, capillarity, and viscosity. The findings from these analyses were used to formulate learning objectives and establish the proposed characteristics of the E-LKPD.

The instruments consisted of a teacher interview guide, a student needs analysis questionnaire, and an initial critical thinking test. The interview guide was used to identify classroom conditions and existing teaching materials. The questionnaire gathered information about students' needs for digital learning materials and their preferred learning experiences. The initial critical thinking test was developed based on the six indicators adopted in this study, drawing on Facione's critical thinking framework [5]. The test items were contextualized within static fluid content to assess students' initial abilities.

Quantitative data obtained from the needs analysis questionnaire and critical thinking skills test were analyzed descriptively using percentages. The percentage score was calculated by comparing the score obtained with the maximum score that could be achieved using the following equation:

$$P = \frac{\Sigma_x}{\Sigma_{xi}} x\ 100\%$$

Note:
P is the percentage score,
Σ_x is the score obtained for each indicator,
Σ_{xi} is the maximum score.

The resulting percentage score is interpreted using the criteria presented in Table 1.

Qualitative data obtained from teacher interviews and analysis of learning materials were analyzed descriptively by identifying findings related to curriculum requirements, learning conditions, teaching materials, technology utilization, contextual learning, local wisdom, and facilitation of students' critical thinking skills. The criteria used in interpreting the data from the needs analysis can be seen in Table 1.

Table 1. Percentage criteria for student needs analysis

Total score range(%)	Category
81-100	Very high
61-80	High
51-60	Moderate
21-40	Low
0-20	Very Low

source:[27]

III. RESULTS AND DISCUSSION

Results

The Define stage is conducted to obtain information about the initial conditions of learning, student characteristics, teaching material needs, initial critical thinking skills, concepts to be developed, learning tasks, and learning objectives that are the basis for the development of E-LKPD. The analysis is carried out through initial analysis, student analysis, task analysis, concept analysis, and the formulation of learning objectives. The results of the analysis are the basis for designing Static Fluid E-LKPD based on Problem Based Learning (PBL) and local wisdom with the help of Canva AI.

The initial analysis was carried out to identify the learning conditions of physics and teaching materials used at SMA Negeri 1 Lunang. Information was obtained through interviews with physics teachers. The results of the interviews showed that learning had used the Independent Curriculum. Static Fluid Materials were studied in class XI semester 1. In learning, teachers used textbooks and available learning media and applied group discussions and giving examples related to daily life.

The school had facilities to support digital learning, and students were permitted to use mobile phones during lessons. However, digital technology had not yet been fully utilized in teaching materials to make learning more

interactive. The materials did not optimally incorporate interactive digital elements, such as videos and animations, or problem-based learning activities. In addition, local wisdom had not been integrated into the teaching materials, and the activities did not specifically target the development of students' critical thinking skills.

Table 1. Results of Initial Learning Analysis

Yes	Aspects analyzed	Learning Conditions
1	Curriculum	Independent Curriculum
2	Material	Static fluid class XI Semester 1
3	Teaching Materials	Textbooks and LKPD
4	Learning melodies	Group discussions and examples of daily life
5	Digital facilities	Available and students can use mobile phones in learning
6	Interactive digital teaching materials	Not yet utilized optimally
7	Integration of PBL and local wisdom	Not optimally integrated
8	Activities to practice skills Critical Thinking	Not optimally facilitated

The initial test of critical thinking skills is prepared based on six indicators of critical thinking skills according to Facione (2015), namely interpretation, analysis, evaluation, inference, explanation, and self-regulation. The results of the initial test are presented in Figure 1.

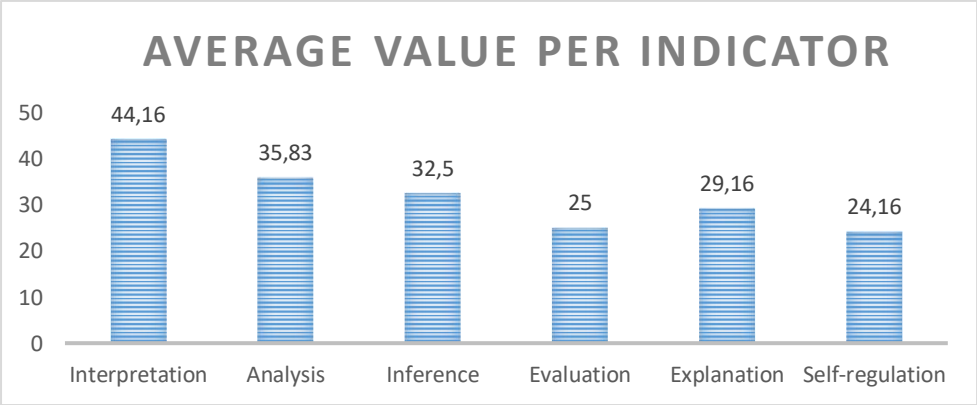


Figure 1. Student's Initial Critical Thinking Skills

Based on Table 2, the average critical thinking skills of students are 31.08% and are included in the weak category. The interpretation indicator obtained the highest percentage of 44.16%, while self-regulation obtained the lowest percentage of 24.16%. This achievement shows that the ability of students to interpret information on the given instrument is relatively better than the ability in other indicators. On the other hand, the low achievement in the indicators of analysis, evaluation, inference, explanation, and self-regulation shows the need for learning activities that provide opportunities for students to process information, provide reasons, draw conclusions, explain the thinking process, and re-examine the results of completion.

In addition to critical thinking skills, student analysis is carried out to determine the needs and characteristics of students for physics learning and the use of digital teaching materials.

Table 2. Results of Student Needs Analysis

Yes	Aspects analyzed	Percentage(%)
1	Interest in studying physics	86,85
2	Digital learning readiness	96,50
3	Manteri presentation preferences	
	a) View	48
	b) Read	4
	c) Writing	28
	d) Listen	36

The student needs analysis aimed to identify students' characteristics and needs related to physics learning and digital teaching materials. The results showed that interest in learning physics was 86.85%, while readiness for digital learning was 96.50%. These findings suggest that students were generally prepared to engage with digital teaching materials using devices available to them.

Regarding preferences for material presentation, 48% of students selected viewing, while 4%, 28%, and 36% selected reading, writing, and listening, respectively. These results can inform the presentation of the E-LKPD, particularly by including appropriate visual elements such as images, illustrations, diagrams, and representations of physical phenomena. However, these preferences should not be used to restrict the materials to visual content alone, because physics learning also requires text, investigations, discussion, and reflection. The needs-analysis findings were therefore considered when planning an E-LKPD with engaging visuals and structured critical-thinking activities.

The task analysis identified the activities students need to complete to achieve the learning objectives for static fluids. It also examined whether the tasks aligned with the use of digital technology, contextual problems, local wisdom, and critical thinking skills. This analysis informed the types of tasks and activities to be included in the E-LKPD so that students could both understand physics concepts and apply them to problem-solving. The results are presented in Table 3.

Table 3. Resukt of the Task Analysis

Number	Aspects analyzed	Condition
1	Materials and tasks are in accordance with CP and TP Static Fluid	Aligned
2	Materials and Exercises are organized systematically	Available
3	Interactive use of digital learning resources	Not yet optiomal
4	Presentation of contextual phenomena familiar to students	Not yet optiomal
5	Integration of local wisdom in learning tasks	Not yet optiomal
6	Alignment of tasks with the six critical thinking skills indicators	Not yet optiomal

As shown in Table 3, the existing materials and exercises supported learning about static fluids, but several aspects still needed improvement. Digital technology was not used optimally, contextual phenomena were not central to learning activities, and local wisdom had not been specifically integrated. In addition, the tasks did not systematically address all six critical thinking skills indicators.

The tasks in the E-LKPD therefore need to go beyond conventional exercises. They should begin with contextual problems that give students opportunities to interpret information, analyze problems, evaluate possible solutions, draw inferences, explain their reasoning, and monitor their own thinking. Integrating PBL is relevant because its learning sequence can guide students to understand problems, conduct investigations, develop solutions, and evaluate their results. Problems can also draw on local wisdom and practices in the South Pesisir community, helping connect physics concepts with students' everyday lives. Concept analysis was conducted to identify and organize the concepts to be included in the static-fluids E-LKPD. The purpose was to establish relationships among the concepts and arrange the material systematically in line with the learning objectives. The material comprises five subtopics: hydrostatic pressure, Archimedes' principle, Pascal's law, capillarity, and viscosity. The relationships among these concepts are presented in Figure 2.

The concept map in Figure 2 shows the relationship between Static Fluid material and the five main subchapters developed in E-LKPD. Hydrostatic pressure discusses the pressure exerted by fluids due to depth, Archimedes' Law deals with the buoyancy force experienced by objects in fluids, while Pascal's Law discusses the continuation of pressure on fluids in enclosed spaces. In addition, capillary material discusses the symptoms of rising or falling fluid surfaces in small pipes, while viscosity is related to the viscosity of fluids and resistance to their flow. The five subchapters are further related to phenomena and problems in daily life so that they can be the basis for the preparation of learning activities based on Problem Based Learning and local wisdom in the developed E-LKPD. The formulation of learning objectives is carried out based on the results of curriculum analysis, concepts, student characteristics, and critical thinking skill development needs. Learning objectives are directed so that students not only understand the concept of Static Fluid, but also be able to use the concept to analyze and solve contextual problems.

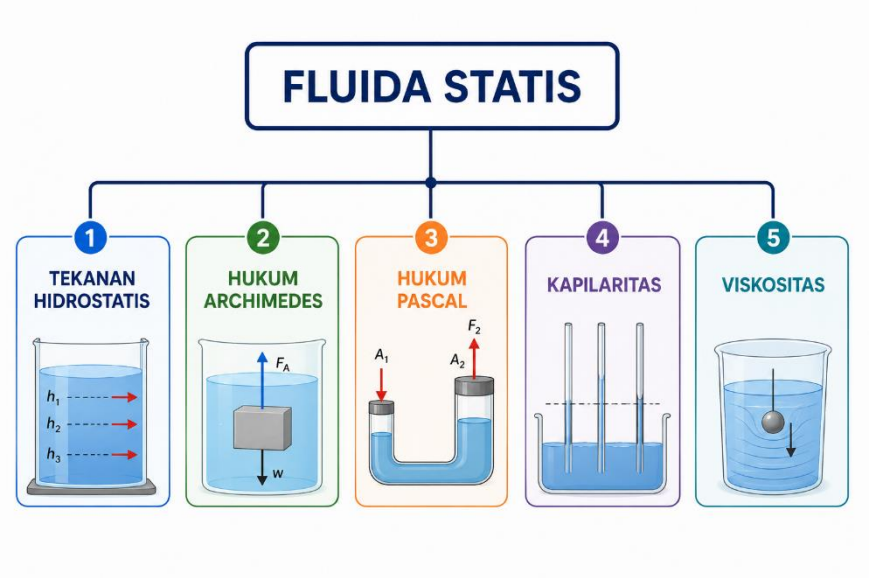


Figure 2. Concept Map of Static Fluids

Table 4. Formulation of Learning Objectives

Learning Outcomes	Understanding Physics: At the end of Phase F, students are able to analyze the relationship between motion and force and their use to explain natural phenomena, design, or structural engineering; create works that demonstrate the application of fluid laws in everyday life; analyze the concepts of heat and thermodynamics and their application to identify climate change phenomena; analyze wave symptoms and their application in everyday life; evaluate electrical circuits; analyze electromagnetic phenomena; analyze the basic theories of modern physics and their influence on technological developments; and apply basic theories of digital in everyday life. **Process Skills:** 1. **Observe:** Students are able to observe scientific phenomena in daily life as well as in the laboratory and record the results of their observations by paying attention to the details of the observed object to raise questions to be investigated. 2. **Questioning and Predicting:** Students are able to formulate scientific questions about the relationships between variables and hypotheses that can be investigated scientifically. 3. **Planning and Conducting Investigations:** Students are able to plan and select appropriate methods and control variables based on references to collect reliable data; select and use tools and materials, including the use of appropriate digital technologies to collect and record data systematically and accurately. 4. **Processing, Analyzing Data and Information:** Students are able to interpret the information obtained honestly and responsibly; use various methods to analyze patterns and tendencies in the data; describe the relationships between variables and identify inconsistencies that occur; use data and references to draw conclusions consistent with the results of the investigation. 5. **Evaluating and Reflecting:** Students are able to identify sources of uncertainty and possible alternative explanations in order to evaluate conclusions and explain specific ways to improve the quality of the data; analyze the validity of information from primary and secondary sources and evaluate the approaches used to solve problems in the investigation. 6. **Communicating Results:**

	Students are able to communicate the results of research systematically and completely supported by scientific arguments and open to more relevant opinions.
Learning Objectives	Students are able to analyze the concept of Static Fluids which includes hydrostatic pressure, Archimedes' Law, Pascal's Law, capillarity, and viscosity and apply them to solve contextual problems in daily life and local wisdom.

The learning objectives were further translated into the Learning Objectives Flow (ATP) and Indicators of Learning Objective Achievement (IKTP), based on the scope of the material and the learning activities planned for each meeting.

Table 5. Description of ATP and IKTP

Meetings	ATP	IKTP
1	Students are able to analyze the concept of hydrostatic pressure and its application in daily life.	1. Identify the factors that affect hydrostatic pressure. 2. Analyze the relationship of depth to fluid pressure. 3. Using the hydrostatic pressure equation to solve the problem. 4. Explain the application of hydrostatic pressure to phenomena in the surrounding environment.
2	Students are able to analyze the concept of Archimedes' Law and its application to objects in fluids.	1. Identify the forces acting on objects in the fluid. 2. Analyzes the relationship of buoyancy forces with the volume of the dipped object and the density of the fluid. 3. Explain the condition of objects that float, float, and sink. 4. Analyze the application of buoyancy force to boats or coastal community activities.
3	Students are able to analyze the concepts of Pascal's law and its application to simple technology.	1. Explains the principle of pressure forwarding in a fluid in an enclosed space. 2. Analyze the relationship of force and cross-sectional area in hydraulic systems. 3. Conduct a simple investigation using the appropriate tools. 4. Explain the application of Pascal's Law to hydraulic tools in everyday life.
4	Students are able to analyze the phenomenon of capillarity and the factors that affect it in daily life.	1. Identify capillary phenomena. 2. Explain the relationship between capillarity and the properties of the liquid substance and the size of the gap. 3. Perform simple observations of capillary symptoms. 4. Conclude the results of observations based on the evidence obtained.
5	Students are able to analyze the concept of viscosity and its effect on fluid motion or flow.	1. Identify differences in viscosity of multiple fluids. 2. Analyzes the relationship between viscosity and flow resistance. 3. Perform a simple investigation to compare the viscosity of several liquids. 4. Explain the application of the concept of viscosity in daily life

Discussion

The results of the initial analysis show that SMA Negeri 1 Lunang already has conditions that support the application of digital teaching materials, but its use in Static Fluid learning has not been optimal. The teaching materials used are still dominated by textbooks and LKPDs, so the use of interactive digital teaching materials has not been carried out optimally. This condition shows that the availability of digital facilities needs to be followed by teaching materials that are able to utilize technology to support students' learning activities. Digital teaching

materials not only serve to represent printed materials in electronic form, but can also provide activities that allow students to interact with information and learning problems [11], [12]. This is in line with research that shows that E-LKPD can support student engagement and critical thinking skills development through the presentation of materials and more interactive learning activities [14], [15]. The findings of Tanjung and Emiliannur also show that needs analysis can identify learning problems and become the basis for determining the need for the development of PBL-based E-LKPD [29]. Thus, the initial conditions of learning are the basis for the need for the development of E-LKPD which is not only in electronic form, but also contains interactive and directed learning activities.

The low level of critical thinking skills with an average achievement of 31.08% strengthens the need for teaching materials that provide opportunities for students to practice the thinking process systematically. Of the six indicators analyzed, self-regulation obtained the lowest achievement, which was 24.16%. This achievement shows that learning activities need to provide opportunities for students to re-examine the thinking process, assess the accuracy of answers, and correct errors in problem solving. This is in accordance with the concept of self-regulation in critical thinking skills which includes the process of examining and correcting the thinking process carried out by Facione [5]. This finding is also in line with the research of Emiliannur, Hamidah, and Wulan which shows that students' critical thinking disposition skills still need to be improved in various indicators [28]. The research strengthens the importance of analyzing students' initial conditions as a basis for determining learning needs that can support the development of critical thinking. These findings are also in line with research that shows that critical thinking skills need to be trained through activities that encourage students to analyze information, evaluate problems, and give reasons for the answers obtained [3], [4]. Therefore, the need for E-LKPD is not only related to the digital presentation of materials, but also to the provision of activities that can facilitate the systematic practice of critical thinking skills.

The selection of Problem Based Learning (PBL) as the foundation of E-LKPD is related to these needs because PBL places problems as the starting point of learning. Through PBL, students are directed to understand problems, organize the learning process, conduct investigations, develop solutions, and evaluate the problem-solving process [6], [7]. This series of activities can be designed to provide opportunities for students to practice interpretation when understanding problems, analysis when identifying relationships between information, evaluation when assessing alternative solutions, inferences when drawing conclusions, explanations when presenting reasons, and self-regulation when examining and reflecting on the solution process. Research on the application of PBL in physics learning also shows that problem-solving activities are related to the development of students' critical thinking skills [8], [9]. In addition, Tanjung and Emiliannur through the analysis of the need for the development of PBL-based E-LKPD show that E-LKPD can be directed as an electronic teaching material to answer the needs of learning and technological development [29]. Thus, PBL in E-LKPD can be used as a framework to design activities that provide opportunities for students to train the six indicators of critical thinking skills gradually.

Student’s preferences for material presentation were 48% for viewing, 4% for reading, 28% for writing, and 36% for listening. These results may inform the presentation of the E-LKPD, particularly through the inclusion of visual elements. Images of phenomena, diagrams, experimental illustrations, and structured information can help represent static-fluid concepts and phenomena [21], [25]. Canva AI can support the creation and organization of visual elements for presenting the material and learning activities. Nevertheless, its outputs should be checked for scientific accuracy, alignment with learning objectives, and suitability for students. In this study, Canva AI serves as a design and visualization tool, while the learning structure is determined by the learning objectives, PBL syntax, static-fluids content, and students’ critical thinking needs.

The task analysis shows that learning activities need to be directed at problem solving that allows students to observe phenomena, identify relevant information, conduct investigations, analyze data, develop solutions, and conduct evaluations and reflections. These characteristics are in accordance with the needs for the development of critical thinking skills found in the results of the initial test. The integration of these activities into E-LKPD can make students not only receive information, but also be involved in the process of thinking and problem solving. Anabel, Akmam, Mufit, and Emiliannur's research on fluid materials shows that LKPD can be designed with a specific learning model to facilitate the critical thinking skills of grade XI students [30]. Although the learning approach used in the study is different from PBL in this study, the findings still reinforce the relevance of LKPD development on fluid materials that are specifically designed to provide space for critical thinking activities. Therefore, the activities in the E-LKPD developed need to be arranged in a directed manner so that each stage of learning provides opportunities for students to use the critical thinking process.

The concept analysis shows that the Static Fluid material to be developed includes hydrostatic pressure, Archimedes' Law, Pascal's Law, capillarity, and viscosity. The five submaterials have a strong relationship with the phenomena of daily life so that they can be used as a context in PBL problems. Hydrostatic pressure can be associated with the depth of water, Archimedes' Law with the phenomenon of floating objects or boat activities, Pascal's Law with hydraulic technology, capillarity with the rising event of liquid substances, and viscosity with

the viscosity and flow of fluids. The use of these phenomena also provides space to integrate local wisdom that is close to the lives of people in the South Coast area. Thus, the concept of Static Fluid is not only presented as a collection of equations, but can be developed through contextual problems that encourage students to connect physics concepts with the surrounding environment.

Integrating local wisdom into the E-LKPD is relevant because familiar contexts can help students connect physics concepts with real-life experiences. In this study, local wisdom is intended to provide a context for learning problems rather than serve merely as supplementary cultural information. Phenomena associated with coastal-community activities can be used to pose problems that students analyze using static-fluid concepts. This approach can help students recognize how physics explains phenomena in their environment and strengthen the contextual character of the E-LKPD while supporting PBL through authentic problems.

Overall, the results of the Define stage show a relationship between three main needs, namely the need for interactive digital teaching materials, the need for activities that facilitate critical thinking skills, and the need for a learning context that is close to students' lives. These three needs are the basis for integrating PBL, local wisdom, and Canva AI in the development of E-LKPD. PBL is used as a framework for problem-solving activities, local wisdom is used as the context of problems relevant to students' environments, while Canva AI is used as a tool in the visual presentation and design of E-LKPD [15], [19], [20], [23]. The research findings of Emiliannur et al. regarding the need for learning development to improve critical thinking skills [28], Tanjung and Emiliannur regarding the need for PBL-based E-LKPD [29], and Anabel et al. regarding the development of LKPD in fluid materials to facilitate critical thinking skills [30] provide support for the direction of product development in this study. The integration is directed to produce E-LKPD characteristics that are in accordance with the learning needs identified at the Define stage. Thus, the findings at the Define stage provide a rational basis for product design at the Design stage and product development at the Develop stage in accordance with the 4-D model [24].

IV. CONCLUSION

The needs analysis at the *Define stage* indicates the need to develop an E-LKPD on static fluids based on *Problem-Based Learning* (PBL) and local wisdom, with visual design supported by Canva AI. Grade XI Phase F students at SMA Negeri 1 Lunang demonstrated low initial critical thinking skills, with an average score of 31.08%, while self-regulation had the lowest achievement at 24.16%. The findings also revealed that interactive digital teaching materials, the integration of PBL and local wisdom, and structured critical-thinking activities had not been optimally implemented. These findings provide a basis for the *Design* and *Develop* stages of the 4-D model, particularly in designing contextual problems, PBL-based learning activities, relevant local-wisdom contexts, and visual materials that support the six indicators of critical thinking skills. However, the effectiveness of the E-LKPD remains to be investigated through subsequent development and testing.

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