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# Development of Interactive Learning Media Using ClassPoint to Enhance Students' Critical Thinking Skills in Fluid Mechanics

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**A B S T R A C T**

This study was motivated by students' low critical thinking skills in physics learning, particularly in fluid mechanics, as well as the continued implementation of teacher-centered instruction in classrooms. The purpose of this study was to develop interactive learning media assisted by ClassPoint to improve students' critical thinking skills in fluid mechanics. This study employed a Research and Development (R&D) method using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. The implementation phase applied a one-group pretest-posttest design involving 29 eleventh-grade students at a public senior high school in Bengkulu City. Data were collected through interviews, questionnaires, expert validation sheets, and pretest-posttest tests. The results showed that the developed media achieved high validity in terms of content, presentation, and media appropriateness based on expert evaluations. The implementation of the media also improved students' critical thinking skills and encouraged active participation during learning activities. In addition, students gave very positive responses toward the use of the media in physics learning. Therefore, the interactive learning media assisted by ClassPoint are considered feasible and effective for supporting physics learning and improving students' critical thinking skills in fluid mechanics.

## 1. Introduction

The objectives of education in the twenty-first century place a strong emphasis on developing critical thinking and creativity in addition to knowledge acquisition, communication, and collaboration skills (Barus, 2024). These skills are considered important because they enable students to analyze information, solve problems, work together, and adapt to technological changes and increasingly complex social demands (Thornhill-Miller et al., 2025; Tohani & Aulia, 2022). Among these skills, critical thinking is a fundamental competency that underpins students' ability to

interpret information, evaluate evidence, and make rational and systematic decisions (Manurung et al., 2023; Rendi et al., 2024). A study by Facione (2015) claims that the skills of interpretation, analysis, assessment, inference, and explanation are all part of critical thinking, which serve as important guidelines in designing learning that is oriented toward higher-order thinking. In science education, particularly in physics, critical thinking skills are becoming increasingly important because physics concepts require deep conceptual reasoning rather than just memorizing formulas. However, physics instruction in schools still tends to be dominated by a teacher-centered, transmissive approach, so students have limited opportunities to explore concepts, test arguments, and build understanding independently (Kamal & Abbas, 2025; Kanthimathi & Raja, 2025). This situation contributes to low levels of critical thinking abilities and to the emergence of misconceptions, particularly regarding abstract physics concepts such as fluids. This situation may be attributed to the limited availability of teaching materials and interactive learning media capable of stimulating students to apply critical thinking skills to explore and process information.

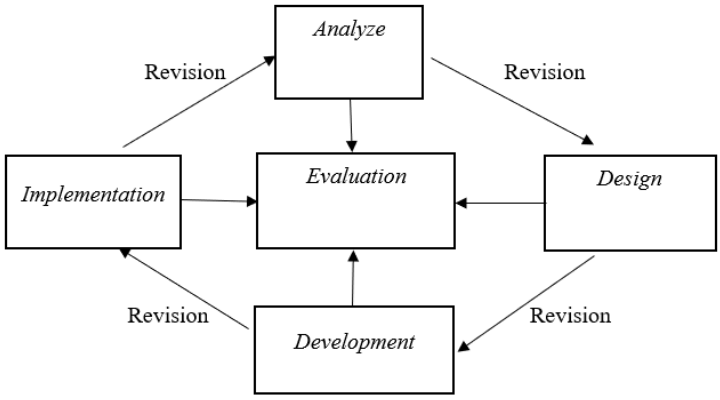
An interview with an 11th-grade physics teacher with 15 years of experience as a public high school teacher (SMAN) in Bengkulu City-which served as the research site-revealed that the topic of fluid mechanics, including abstract fluid concepts (hydrostatic pressure and Archimedes' principle), requires a deep conceptual understanding to connect theory with everyday phenomena. Teacher-centered instruction using problem-solving exercises encourages students to memorize formulas to answer textbook-based questions without providing opportunities for students to explore conceptual reasoning, leading to misconceptions regarding fluid topics among students (Rahma et al., 2023; Selamet, 2022; Simamora & Kurniawan, 2023).Conversely, instruction that utilizes interactive digital learning media has been demonstrated to improve conceptual knowledge, motivation, and student engagement by offering an active, visual, and contextual learning experience (Anisa et al., 2021; Septiany et al., 2024; Oktaviyanti et al., 2025). In addition to encouraging students to analyze problems, assess information, and solve problems on their own, interactive learning materials in physics education also help students build critical thinking abilities. One platform increasingly adopted is ClassPoint, which offers real-time quizzes, polls, and student responses, thereby supporting two-way interaction during the learning process.

Previous research indicates that ClassPoint is effective in enhancing motivation and learning outcomes; however, most of these studies have primarily focused on aspects of motivation, engagement, or general learning outcomes, without specifically integrating critical thinking indicators into the design of instructional media (Dhaniartika et al., 2025; Waney & Liando, 2025). Furthermore, research related to fluid concepts and the application of ClassPoint to foster critical thinking among high school students remains very limited, particularly studies oriented toward learning activities guided by the stages Critical thinking markers including interpretation, analysis, evaluation, inference, and explanation are incorporated into Problem-Based Learning (PBL). (Aulia et al., 2024; Suherman et al., 2025). Thus, this study is expected to produce a viable interactive learning tool, provide insights into 11th-grade students' responses to its use, and demonstrate improvements in

critical thinking skills following the implementation of an interactive learning tool supported by ClassPoint on the topic of fluids. Based on the identified research gap, this study aims to develop interactive learning media assisted by ClassPoint for fluid mechanics material using the Problem-Based Learning (PBL) approach to improve eleventh-grade students' critical thinking skills. Specifically, this study aims to: (1) determine the feasibility of the developed media based on expert validation, (2) examine students' responses toward the media, and (3) analyze the improvement of students' critical thinking skills after using the developed media.

## 2. Methodology

This study applied the Research and Development (R&D) method to develop interactive learning media assisted by ClassPoint. According to Nusantara et al. (2023), R&D is a research process aimed at developing a new product or improving an existing one. The development process employed the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. The ADDIE model was selected because it provides systematic, structured, and sequential procedures for developing instructional media. Branch (2009) explains that each stage in the ADDIE model is interconnected and contributes to producing effective and efficient learning media that align with students' learning needs in physics education.




Source: Branch (2009)

Figure 1. The Stages of the ADDIE Model

The analysis phase was conducted to identify the curriculum requirements, student characteristics, and learning problems related to fluid mechanics instruction. Interviews were conducted with eleventh-grade physics teachers to identify students' learning needs and difficulties in understanding fluid mechanics concepts. Student characteristics (ages 17 to 19) were determined through interviews. An analysis of the Merdeka curriculum documents was conducted to (a) examine the learning outcomes (CP) covering the competencies to be achieved in 11th grade and identify the learning objectives (TP); (b) analyze the curriculum content, including an examination of fluid topics and concepts: hydrostatic pressure and Archimedes' principle; the interconnections between physics topics studied in 10th grade and

their continuity with topics to be studied in 12th grade; and (c) analyze instructional approaches or models and learning media that can be implemented to achieve the LOs and LOs effectively. The Problem-Based Learning (PBL) model recommended by the Merdeka Curriculum was integrated with the developed interactive learning media.

The design phase aimed to develop innovative instructional media that meet the learning needs of eleventh-grade students. The design of the instructional media is based on information or data collected during the analysis phase (Peterson, 2003). Additionally, the results of relevant and recent literature reviews on the use of digital technology in physics education serve as the basis for selecting and determining the instructional media to be developed. Various open-access platforms and applications were examined to design innovative, interactive learning media that help students engage in learning fluid concepts. Thus, the developed media facilitate students' conceptual understanding of fluid mechanics through interactive visualization and contextual learning activities.During the development phase, the interactive learning media were developed based on the results of the analysis and design phases to ensure that the product was appropriate and effective for physics learning. The development process consisted of drafting, production, and evaluation stages. A description of the work procedures and objectives for these three stages is presented in Table 1.

Table 1. Stages, Procedures, and Objectives of Drafting, Production, and Evaluation

| Stage | Procedure | Objectives |
|---|---|---|
| Drafting | Creating a preliminary draft of an interactive PowerPoint slide using ClassPoint | To develop a systematic instructional design |
| | Creating a storyboard for the fluid mechanics lesson (hydrostatic pressure and Archimedes' principle) | To describe the learning process for fluid mechanics material in an interactive manner |
| | Determining the type of interactivity (quiz)<br>Developing critical thinking questions for the quiz | To ensure that learning activities using interactive media stimulate critical thinking. |
| Production | Creating interactive slides using ClassPoint. | Developing innovative and interactive learning materials |
| | Adding illustrations, animations, and educational videos | Providing students with engaging and challenging learning experiences |
| | Incorporating critical thinking questions about fluid phenomena into interactive media | Ensuring that learning materials support critical thinking skills |
| Evaluation | Review by physics professors and teachers to receive feedback and suggestions for improvement. | Ensuring that the educational materials meet the eligibility criteria in terms of content, language, and presentation. |
| | Revise the work based on feedback from the reviewers and ninth-grade students. | Ensuring that the educational materials effectively enhance critical thinking skills. |
| | | Producing educational materials that are ready for use during the implementation phase. |

During the implementation phase, the revised instructional materials were used in physics instruction for 11th-grade students. Before instruction, a pretest was administered to assess students' prior knowledge of fluid concepts. Face-to-face instruction was conducted for 3 class periods (150 minutes) each week. The instruction employed the PBL model using interactive learning media supported by ClassPoint. Students learned in groups, and each group used Android smartphones to access the interactive learning media. A post-test was administered after three instructional sessions. The following day, To assess their reactions to the ClassPoint instruction, students were invited to fill out a questionnaire. The evaluation step, which was the last stage, sought to evaluate the overall quality and effectiveness of the instructional media. However, the development team also conducted formative evaluations at each stage.

In the second semester of the 2026–2027 school year, 29 eleventh graders at a public high school (SMAN) in Bengkulu City participated in this study, located in Bentiring, Muara Bangkahulu District, Bengkulu City. Data collection utilized observation, interviews, questionnaires, and written tests. Observations were conducted to assess the state of physics instruction in the school or Classroom and the use of previously employed physics learning media. Interviews were conducted with the physics teacher to gather information regarding the need for learning media and the difficulties students faced in understanding fluid mechanics material. Questionnaires were administered to students to gauge their perceptions, learning challenges, and responses to the use of the developed interactive learning media. Additionally, After using interactive learning materials, students' critical thinking abilities were evaluated using pretests and posttests supported by ClassPoint.

This study employed quantitative descriptive methods in analyzing the data. in data analysis. To ascertain the degree of viability of the created learning materials, the expert validation data were examined using a feasibility percentage. Based on pretest and posttest findings, the N-Gain formula was used to analyze data from the critical thinking skills test in order to assess how much students' critical thinking abilities had improved. In order to ascertain the degree of student acceptance and feedback regarding the educational medium utilized in the learning process, data from the student response questionnaire were also examined using percentages. The implementation phase employed a one-group pretest-posttest design to measure the improvement of students' critical thinking skills after using the developed learning media. Students completed a pretest before the learning activities and a posttest after the implementation of the ClassPoint-assisted media. The comparison between pretest and posttest scores was used to analyze the effectiveness of the developed media in improving students' critical thinking skills.

**Content Validity Analysis**

The suitability of the instructional media is determined by the content validity of the physics material, the language used to present fluid concepts, and the presentation itself. Assessment scores from three expert validators were used to determine the suitability of the developed instructional media, calculated using the Aiken V formula (Equation 1). ClassPoint-assisted interactive learning media meet

the suitability requirements if the Aiken V index is > 0.81, which is a high criterion. In addition, the suitability criteria are determined by the consistency (reliability) of the assessments among the three validators. If the established standards are not met, the media must be revised or redesigned. The validity criteria are determined based on Table 1.

$$V = \frac{\Sigma S}{n\,(c-1)} \quad (1)$$

Description :
V : Aiken Index
S (R – $L_o$ ) : The validator rater's score (R) less the lowest score (Lo)
c : Highest rating (5)
n : Number of raters

The results of the Aiken's V index calculation are shown in Table 1.

Tabel 1. Content Validity Criteria

| Aiken's V Index Interval | Validity Criteria |
|---|---|
| > 0.81 | High Validity |
| 0.41 – 0.8 | Moderate Validity |
| < 0.4 | Low Validity |

(Sumber:Aiken, 1980)

### *Analysis of Critical Thinking Skills*

Tests given prior to instruction (pretest) and following instruction (posttest) were used to gauge students' critical thinking abilities. Interpretation, analysis, evaluation, inference, and explanation were utilized as measures of critical thinking abilities. Following a quantitative analysis of the data derived from these test findings, the quantitative data was transformed into qualitative data. The purpose of this investigation is to ascertain whether using ClassPoint-assisted learning materials has improved students' critical thinking abilities. Subsequently, the scores obtained are calculated using the Normalized Gain (N-Gain) equation shown in Equation 2 (Supriadi 2021).

$$\text{N-Gain} = \frac{score\ posttest - score\ pretest}{score\ \ maksimal - score\ pretest} \times 100\% \quad (2)$$

Table displays the findings of the N-gain interpretation of these critical thinking abilities 3.

Table 3. N-gain Calculation Criteria

| Interval N-Gain | Criteria |
|---|---|
| g > 0.7 | High |
| 0.3 ≤ g ≤ 0.7 | Moderate |
| 0 < g < 0.3 | Low |

(Fitri & Firmansyah., 2025)

### *Analysis of Student Responses*

The examination of students' answers survey data was conducted quantitatively to determine students' responses to the developed product. The survey data were then converted to qualitative data using a Likert scale. The Likert scale was employed to transform the measured variables into several assessment indicators. The data analysis was conducted in MS Excel to obtain percentage values for each statement item. Next, the average percentage was obtained by summing the percentages for each statement and then dividing by the number of respondents. Student response data were analyzed by calculating response percentages based on the total scores obtained from completed questionnaires. This percentage calculation was performed using the formula shown in Equation 3 (Hasibuan & Megalina, 2024).

$$\text{Score} = \frac{\text{Total Score Obtained}}{Maximum\ Score} \times 100\% \qquad (3)$$

This score represents the average student response score after using the ClassPoint platform. The calculated average score was then compared with the assessment criteria listed in Table 4.

Table 4. Student Response Criteria

| Interval | Criteria |
|---|---|
| 81% % - 100 % | Excellent |
| 61 % - 80 % | Good |
| 41%-60% | Fair |
| 21 % - 40 % | Poor |
| 1 % - 20 % | Very Poor |

## 3. Results and Discussion

### *Results*

### *Analysis Phase*

The learning needs analysis's findings, which were gathered via interviews with physics teachers of eleventh graders, indicate that physics instruction on fluid mechanics still primarily focuses on conveying concepts, leading students to grasp rather than truly understand them. Teachers also noted that students struggle to connect the concepts of hydrostatic pressure and Archimedes' principle to everyday phenomena. This situation results in students having a limited ability to analyze and solve physics problems conceptually. According to Widiandari (2021), students in this study were aged 17–19 years and possessed cognitive abilities at the formal operational stage. However, in physics instruction, students were not yet able to optimally utilize their abstract and logical thinking skills, particularly when analyzing, evaluating, and drawing conclusions about fluid problems. Meanwhile, an analysis of the Merdeka Curriculum documents indicates that the learning outcomes (CP) for fluid mechanics emphasize the ability to understand fluid concepts conceptually and relate them to phenomena in daily life. The learning

objectives (TP) derived from the CP guide students to analyze relationships between concepts and solve contextual problems.

The analysis of the material indicates that the subjects of Archimedes' principle and hydrostatic pressure have strong conceptual links to material covered earlier in 10th grade and serve as the foundation for understanding more advanced material in 12th grade. The analysis also shows that both concepts are abstract and require visualization and a contextual approach to be fully understood by students. The analysis of learning approaches indicated that the Problem-Based Learning model was the most suitable approach to achieving CP and TP is a student-centered model that develops critical thinking skills. Based on this analysis, the PBL (Problem-Based Learning) approach suggested in the Merdeka Curriculum was selected for integration with interactive learning media supported by ClassPoint, as it is deemed capable of facilitating students in analyzing problems, evaluating information, and actively building conceptual understanding.

### *Design Phase*

The design phase's findings show that the educational media developed were designed based on the students' learning needs identified during the analysis phase. The instructional media were organized as interactive slides in ClassPoint, which facilitated students' active engagement in the learning process. The design phase also revealed that the learning media are systematically organized, comprising an introduction, learning objectives, an aperçu, a presentation of the material, practice questions, an interactive quiz, and a conclusion. Each component is designed to support a gradual, targeted understanding of fluid concepts. The design results also indicate that the choice of the PowerPoint platform integrated with ClassPoint was based on a literature review regarding Digital technology's application in physics teaching. The integration of ClassPoint enables the inclusion of interactive features, such as quizzes and polls, designed to enhance students' active participation during instruction.

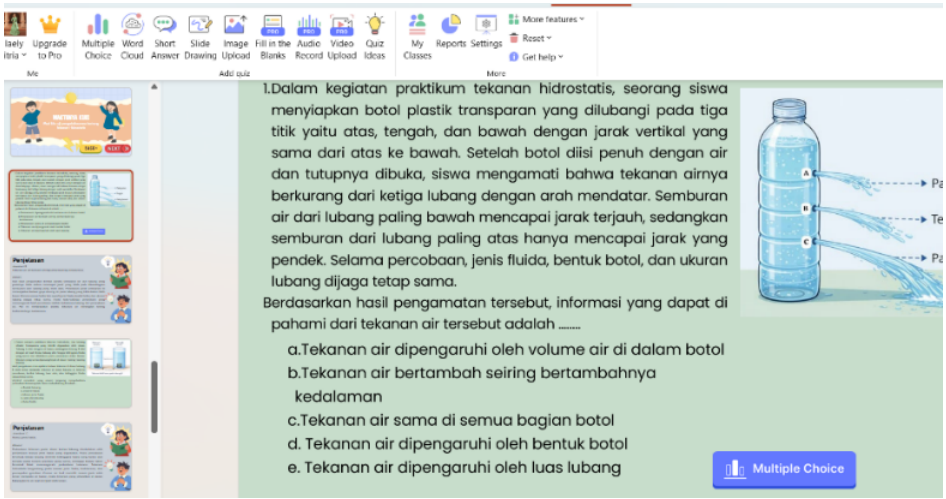



Figure 2a. Feature in ClassPoint

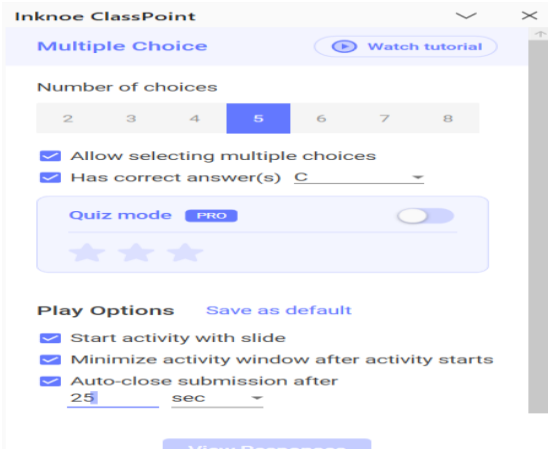



Figure 2b. Polling (Multiple Choice) Feature in ClassPoint

The image above shows an example of the designed interface for the interactive learning media. The media is equipped with a polling feature (multiple-choice) to incorporate polling into the quizzes that will be administered. Additionally, the integrated interactive features allow students to actively participate in the educational process. Consequently, the design phase resulted in an interactive learning media design powered by ClassPoint that is not only systematic and innovative but also capable of facilitating active, visual, and contextual learning tailored to students' needs.

**Development Phase**

The development phase's findings show that the interactive learning materials with ClassPoint assistance were successfully developed through three main stages: drafting, production, and evaluation. During the drafting stage, an initial design for the learning media was produced as systematically organized interactive PowerPoint slides supported by ClassPoint. Additionally, a learning storyboard was created to illustrate the flow of fluid-related material, particularly regarding the concepts of hydrostatic pressure and Archimedes' principleThe results of this stage also show that an interactive quiz is the type of interaction used, along with the creation of questions that require critical thinking to be integrated into the learning media.




Figure 3. A PowerPoint slide display integrated with ClassPoint's interactive features

Figure 3 shows the learning media interface, presented as PowerPoint slides integrated with ClassPoint. The slides include learning components such as an introduction, main menu, user guide, learning objectives, learning flow, content, and animated videos, all systematically organized to aid in the accomplishment of learning goals. The integration of ClassPoint enables direct interaction through quiz, poll, and response features, ensuring that learning is not merely one-way but also involves active student participation.

During the production phase, an interactive learning media product was developed as PowerPoint slides integrated with ClassPoint features. The resulting media features illustrations, animations, and instructional videos to support the visualization of fluid concepts. Additionally, pre-designed critical thinking questions have been integrated into the media as interactive quizzes on fluid phenomena. The results of this stage demonstrate that the media possesses interactive and innovative qualities and can facilitate students' active engagement in learning.

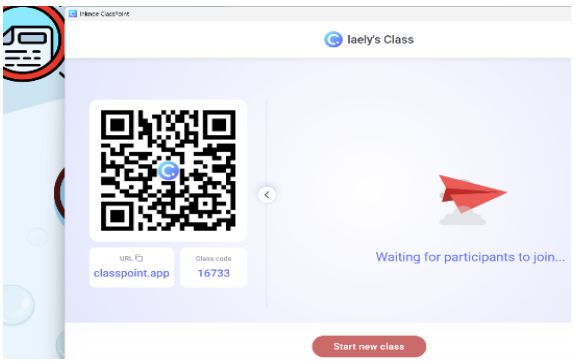



Figure 4a QR Code in ClassPoint

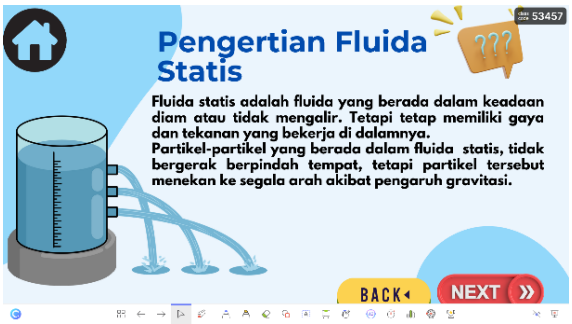



Figure 4b Slide View in ClassPoint

Figures 4a through 4b show the presentation slides integrated with ClassPoint, complete with a class code and a QR code that students can use to join the learning session. Students can log in by entering the class code or scanning the QR code, which is more convenient and minimizes input errors. Once connected, students can participate in real-time learning through the ClassPoint system. This view also shows the initial "waiting for participants to join" status, indicating that the teacher is waiting for all students to join before the lesson begins.

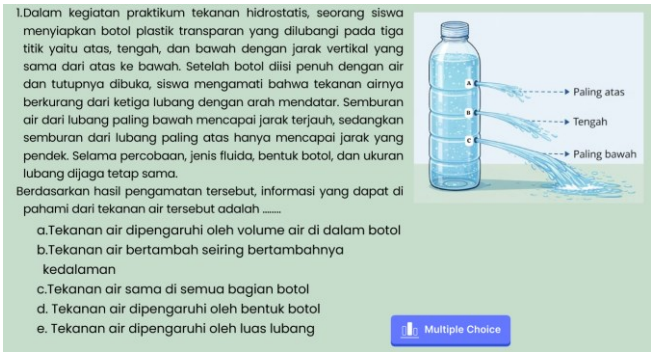



Figure 5. Quiz Feature in ClassPoint

Figure 5 shows the implementation of an interactive multiple-choice quiz feature on ClassPoint, designed using contextual problems from fluid mechanics, such as the comparison of hydrostatic pressure. This quiz requires students to analyze the relationships between physical variables, such as depth, density, and container shape, thereby not only measuring recall but also fostering higher-order thinking. This feature enables real-time student responses, allowing teachers to monitor understanding, identify misconceptions, and analyze students' thinking patterns. Additionally, the quiz also develops critical thinking skills according to the indicators listed by Facione (2015): interpretation, analysis, evaluation, and inference, and explanation. Thus, the use of ClassPoint's interactive quizzes enhances student engagement while fostering critical thinking skills through structured problem-solving.




Figure 6a. Animated Video Illustrating the Concept of Hydrostatic Pressure




Figure 6b. Animated video demonstrating the relationship between infusion depth and fluid pressure, serving as a visual aid for understanding the concept

Figures 6a through 6b show animated videos used as an introductory activity to capture students' attention and connect the material to everyday phenomena. The video illustrates the use of an IV bag and the concept of hydrostatic pressure, where differences in height affect the direction of fluid flow. The presentation of this animated video helps students understand the concept contextually, enhances their readiness to learn, and encourages active student engagement in studying process.

In the assessment stage, the learning media were assessed for suitability based on validation results from university lecturers and high school physics teachers regarding content, presentation, and appropriateness. The outcomes of this stage also show that the media were revised depending on feedback from validators and students, resulting in a final product that is suitable and ready for use in the implementation phase.

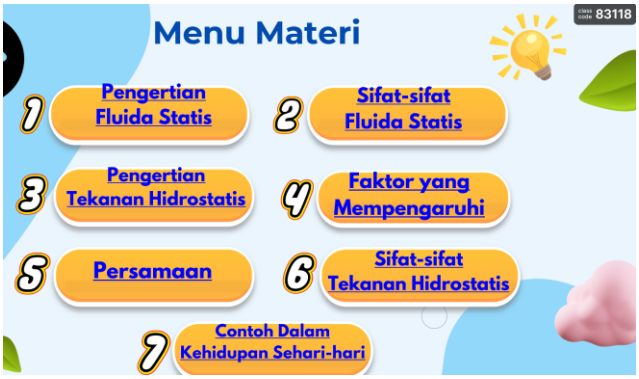



Figure 7a. Media Display After Validation

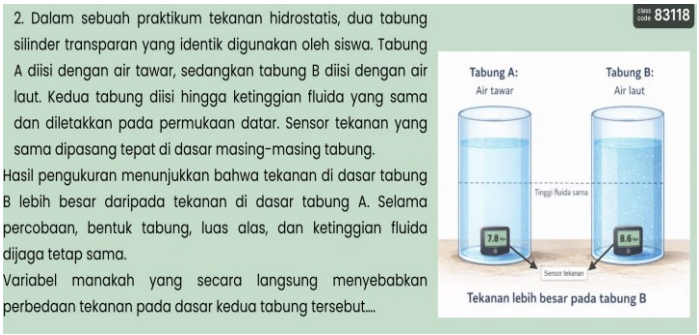



Figure 7b. Media Display After Validation

Figures 7a and 7b show changes to the media display after validation, specifically improvements in the display of the steps to be performed and images that are better aligned with the text or the problem. The purpose of aligning images with the text or problem is to help students visualize the text or problem presented. After physics lecturers and teachers validated the teaching materials, the developed materials were deemed suitable for use in physics instruction on fluids. The next step in the development phase is expert validation to evaluate the items' appropriateness in terms of presentation, content, and appropriateness. This validation aims to gather feedback and evaluate the media's quality before the pilot test. The assessment

results were analyzed using Equation (1) to determine the level of suitability, and Table 5 provides a summary of the findings.

Table 5. Media Validation Results

| Aspect Feasibility | Validator(R) Score | | | $S_1$ | $S_2$ | $S_3$ | $\sum S$ | n (c-1) | Aiken Index (V) | Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | | | | | | | |
| Content | 18 | 19 | 19 | 14 | 15 | 15 | 44 | 48 | 0.91 | High |
| Presentation | 29 | 29 | 29 | 23 | 23 | 23 | 69 | 72 | 0.95 | High |
| Media Suitability | 29 | 28 | 27 | 23 | 22 | 21 | 66 | 72 | 0.91 | High |

Considering Aiken's V Index results calculation, the validity of the three assessed aspects fell into the high category, indicating that these three aspects are highly valid. The assessed aspects include content, presentation, language, communicative effectiveness, and media appropriateness. Overall, The findings in Table 5 show that the educational materials satisfy high validity requirements, indicating that they can be used successfully in the educational process.

### *Implementation Phase*

In the implementation phase, instruction was conducted utilizing the PBL (Problem-Based Learning) approach for fluid mechanics. Before instruction began, students took a pretest to assess their prior knowledge of the subject matter. Next, students were instructed to access ClassPoint-based learning materials using the provided class code or barcode. These materials include an introductory video, learning content, and interactive quizzes that support the learning process. In the initial stage, students watch an animated video to activate their prior knowledge. Afterward, the teacher delivers the content through ClassPoint so that students can follow the explanation visually and systematically. During the learning process, students also actively participate by interacting directly through ClassPoint's features.

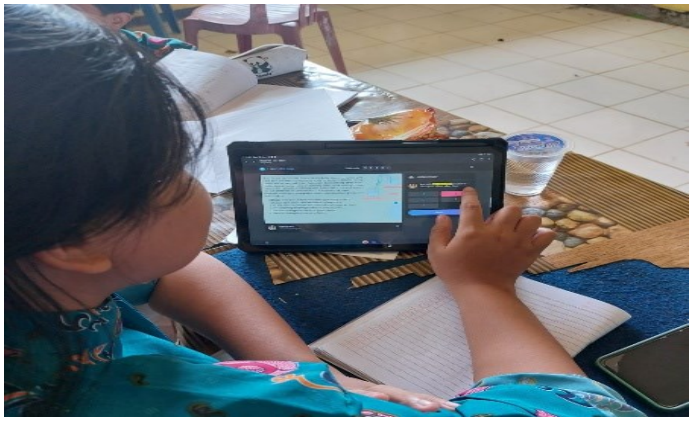


Figure 7b. Implementation Phase: Students Using ClassPoint

After the material was presented, students were instructed to conduct experiments or simulations using PhET that were relevant to the fluid mechanics material. In

addition, students completed the provided Student Worksheets (LKPD). The results of their work were then discussed and presented, allowing students to practice analyzing and concluding the activities they had performed. Next, students took a posttest to assess their understanding following the lesson using the ClassPoint media. Afterward, students completed a questionnaire to provide feedback on the use of media in the learning process. Based on the pretest and posttest results, there was a noticeable improvement in student learning outcomes after using ClassPoint media. The average scores are shown in Table 7.

Table 7. Pretest-Posttest Assessment Results

| Pretest | Posttest | N-gain | Criterion |
|---|---|---|---|
| 21.24 | 78.62 | 0.72 | High |

These findings show that the adopted teaching strategy raises students' critical thinking abilities in addition to improving learning outcomes. Students' critical thinking abilities have improved as a result of using the PBL paradigm, which is supported by the ClassPoint platform. These results are consistent with Elvina's (2025) study, which found that students' critical thinking abilities are greatly improved when they use learning materials via the ClassPoint program. Table 8 displays the rise in pupils' critical thinking scores for each indicator.

Table 8. N-Gain results by indicator

| Indicators Critical Thinking | Pretest | Posttest | N-Gain | Criterion |
|---|---|---|---|---|
| Interpretation | 36.55 | 75.86 | 0.61 | Sedang |
| Analysis | 24.14 | 80.00 | 0.73 | High |
| Evaluation | 17.93 | 79.31 | 0.74 | High |
| Inference | 15.17 | 78.62 | 0.74 | High |
| Explanation | 12.41 | 80.00 | 0.77 | High |

The N-Gain analysis results for each critical thinking skill indicator are shown in Table 8: interpretation, analysis, evaluation, inference, and explanation. This analysis was used to determine improvements in students' abilities by comparing pretest and posttest scores for each indicator. The N-Gain scores obtained are classified to indicate the level of effectiveness of improvement for each indicator. Thus, Table 8 gives a summary of how students' critical thinking abilities have improved during the analyzed aspects.

Student responses are a key indicator of learning effectiveness. A positive response indicates that students feel engaged, comfortable, and able to understand the material, whereas a low response suggests that learning has not been optimal. Therefore, an analysis of student responses is necessary to determine the level of acceptance, interest, students' participation in the learning process that is being implemented (Nisa et al., 2023; Sanova et al., 2024). Student response measurement is conducted using a response questionnaire covering four main aspects: interest and motivation to learn, the appearance and presentation of learning media, critical thinking skills, and ease of use of the media, as displayed in Table 9.

Table 9. Results of the Student Survey on ClassPoint

| Aspect | Average | Rating |
|---|---|---|
| Interest and motivation | 86.44% | Very Good |
| Media presentation | 87.31% | Very Good |
| Critical thinking skills | 87.31% | Very Good |
| Ease of use of the media | 88.69% | Very Good |

Considering the data in the table above, the average results for each questionnaire item completed by students at a high school that is public (SMAN) in Bengkulu City indicate that the use of ClassPoint in PBL-based physics instruction can enhance process skills, meeting the "very good" criterion.

### *Evaluation Phase*

The evaluation phase assesses the caliber and efficacy of the created educational materials. The assessment includes expert validation results, pilot testing of the media, and student responses to ClassPoint-assisted learning. This phase aims to determine the media's suitability and identify its strengths and weaknesses as a basis for improvement. Additionally, the evaluation analyzes improvements in pupils' critical thinking abilities according to the outcomes of the pretest and posttest.

## *Discussion*

### *Media Learning Resources*

The findings of this study demonstrate that interactive learning media assisted by ClassPoint have a very high level of validity, as determined through expert validation. The Aiken's V index value for content, presentation, and media relevance is high, indicating that the media is suitable for physics education. The validity of this finding is supported by the systematic utilizing the ADDIE paradigm in the development process, in which each stage is carried out in a structured manner, from analysis to evaluation. ADDIE emphasizes systematic, needs-based instructional design, resulting in effective, contextually relevant products (Branch, 2009).

Additionally, these results are supported by studies on the creation of interactive media education materials, which shows that media developed through expert validation receive a very high rating and are ready for use in learning (Maharani & Risdianto, 2024). Other studies have also shown that media developed through expert validation have high usability, as evidenced by validation results across content, presentation, and language (Novriyaldi et al., 2024). Therefore, ClassPoint-based learning media are not only theoretically sound but also supported by empirical research showing that the creation of interactive media can meet The caliber standards of physics education.

The use of ClassPoint enhances learning materials by enabling two-way interaction between teachers and students through features like quizzes, polls, and real-time responses. This aligns with previous research indicating that interactive,

technology-based learning materials can improve the presentation of material and facilitate more effective and engaging learning. This demonstrates that the developed media not only meet the validity aspect, but also.

### *Increased Critical Thinking Skills of Students*

According to the investigation, students' critical thinking abilities can be greatly enhanced by utilizing interactive learning materials with ClassPoint. High N-Gain values and a rise in average scores from the pre-test to the post-test serve as evidence of this, specifically 0.72. Additionally, all critical thinking indicators—interpretation, analysis, assessment, inference, and explanation—showed a rise. It has been demonstrated that using interactive technology-based media improves learning outcomes and student engagement while fostering the growth of critical thinking abilities in 21st-century education. (Rahmadina & Anwar, 2025).

This improvement occurs because the developed media not only conveys information but also actively engages students' thinking processes. The integration of interactive features such as quizzes and problem-based questions encourages students to analyze information, evaluate concepts, and draw logical conclusions. Furthermore, the implementation of the Problem-Based Learning (PBL) model in instruction further strengthens critical thinking, as students are presented with real-world problems to solve independently or in groups (Mithasari et al., 2025). These results align with those of Rohadi & Setiawan (2020), who found that activity-based learning significantly improved learning outcomes from the pretest to the posttest by 60%, indicating an increase in students' cognitive abilities. Furthermore, other studies have also shown that in activity-based learning strategies like project-based learning, there is a substantial correlation between student learning outcomes and learning interest. (Wahyuningsih et al., 2021).

The results of this study are consistent with Facione's (2011) theory, which states that critical thinking skills can be developed through activities involving analysis, evaluation, and problem-solving. Other studies have also shown that the use of interactive media combined with active learning models can significantly improve higher-order thinking skills. Furthermore, other studies have shown that the use of interactive technology-based learning media can increase student engagement and help develop higher-order thinking skills in science education (Maharani et al., 2024; Putri et al., 2025).

This increase shows that integrating interactive media with the Problem-Based Learning (PBL) model can create a learning environment that demands active cognitive involvement from students. This finding is consistent with research indicating that the use of interactive media and digital simulations can significantly improve students' higher-order thinking skills (HOTS) and conceptual understanding (Anisa et al., 2020). Therefore, the increase in critical thinking skills in this study is not only due to the media but also to students' active engagement in meaningful learning processes.

### *Student Responses to Learning Media*

Student responses to the use of interactive learning media supported by ClassPoint have been very positive. This is evident from the survey results, which show that all aspects—such as engagement, media presentation, ease of use, and support for critical thinking—were rated as "very good." These positive responses indicate that the developed media is effective in boosting students' motivation and interest in learning. The media's engaging design and interactive features make learning more enjoyable and less monotonous. Additionally, easy access via QR codes and direct integration with students' devices further simplify the use of the media in the learning process.

The high level of student engagement also indicates that the instructional media developed aligns with students' needs and characteristics. Additionally, the use of interactive features such as quizzes and real-time questions encourages students to participate more actively in the learning process. This demonstrates that interactive instructional media can enhance students' motivation to learn and create a more engaging and enjoyable learning environment (Taufiqurrahman, 2022). These results align with research showing that interactive learning media can increase students' interest in learning and positively impact learning outcomes (Saputra et al., 2024).

The positive response from students also indicates that the developed learning media is well-received as an alternative learning tool in physics education. Interactive learning media not only help students understand the subject matter but also enhance their engagement in the learning process (Nurjanah et al., 2022). Furthermore, other studies have shown that student responses to interactive learning media fall into the "very good" category and can increase student motivation and engagement in the learning process (Saputra et al., 2024).

This indicates that the use of interactive media can be a solution to improve the quality of physics instruction, which has traditionally been conventional. This finding is supported by Rohadi & Setiawan (2020), who found that activity- and technology-based learning can significantly improve student engagement, motivation, and learning outcomes. Thus, ClassPoint-assisted learning media is very well received by students and is effective in creating more engaging, interactive, and meaningful learning experiences.

## 4. Conclusion

Based on the findings of this study, the interactive learning media developed with ClassPoint for fluid mechanics were proven to be a feasible and effective method of teaching physics. The media encouraged active student participation and collaborative, problem-based learning activities. It also facilitated the development of critical thinking skills in understanding fluid concepts. Implementing interactive learning media also created a more engaging, student-centered learning environment. Students had a positive attitude toward ClassPoint because it offered

interactive quizzes, visualizations, and real-time participation opportunities that helped them understand abstract physics concepts more meaningfully. In practice, this media can help physics teachers implement interactive, technology-based instruction, especially for abstract topics like fluid mechanics. Integrating smartphones, quizzes, polling, and problem-solving activities via ClassPoint can enhance classroom interaction and student engagement. Further studies are recommended to examine the effectiveness of the developed media in improving higher-order thinking skills in other physics topics and broader educational settings.

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