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Inquiry-driven essay assessment (IDEA) as a framework for evaluating students' argumentation in static fluids

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ABSTRACT

Argumentation is a fundamental aspect of scientific literacy, enabling students to construct, justify, and evaluate claims based on evidence. However, traditional assessments emphasize rote memorization rather than developing reasoning skills, highlighting the need for a more effective evaluation approach. This study aims to develop and validate the Inquiry-Driven Essay Assessment (IDEA) framework to assess students' argumentation skills in static fluids. The research employs the ADDIE model. The participants comprised 26 eleventh-grade students from a Bandung, West Java private school who had prior knowledge of static fluid concepts, including hydrostatic pressure, buoyant force, and the principles of floating and sinking objects. The findings indicate that the developed assessment instrument demonstrates high validity and reliability, with strong internal consistency and alignment with learning objectives. The claim generation aspect obtained the highest average score, while the evidence analysis, justification, and support aspects require further improvement. The study concludes that the IDEA framework can serve as an effective tool for assessing and enhancing students' argumentation skills. The implications of this research suggest that implementing the IDEA framework can provide a more comprehensive and objective evaluation approach in science education, thereby assisting educators in fostering students' critical thinking and argumentation skills more effectively.

Penilaian esai berbasis inkuiri sebagai kerangka untuk mengevaluasi argumentasi siswa dalam fluida statis

Kata Kunci:

keterampilan argumentasi, kerangka penilaian, penilaian esai berbasis inkuiri, literasi sains, konsep fluida

ABSTRAK

Argumentasi merupakan komponen kunci dalam literasi sains, memungkinkan siswa membangun, membenarkan, dan mengevaluasi klaim berdasarkan bukti. Namun, penilaian tradisional lebih menekankan pengulangan fakta daripada keterampilan penalaran, sehingga diperlukan kerangka kerja yang efektif. Penelitian ini bertujuan mengembangkan dan memvalidasi penilaian esai berbasis inkuiri untuk menilai keterampilan argumentasi siswa dalam konteks fluida statis. Metode penelitian menggunakan model ADDIE (Analyze, Design, Develop, Implement, Evaluate) dengan partisipan 26 siswa kelas XI dari *sebuah sekolah swasta di Bandung, yang memiliki pemahaman dasar tentang tekanan hidrostatis, gaya apung, serta prinsip benda terapung dan tenggelam. Hasil penelitian menunjukkan bahwa instrumen penilaian memiliki validitas dan reliabilitas yang baik, dengan keselarasan kuat terhadap tujuan pembelajaran. aspek generasi klaim memperoleh skor tertinggi, sedangkan analisis bukti, justifikasi, dan dukungan masih perlu ditingkatkan. Kesimpulan penelitian ini adalah bahwa kerangka kerja IDEA efektif dalam menilai dan meningkatkan keterampilan argumentasi siswa dalam pembelajaran sains. Implikasinya, kerangka kerja ini dapat digunakan sebagai alat evaluasi yang mendukung pengembangan strategi pembelajaran berbasis argumentasi, sehingga meningkatkan kualitas literasi sains siswa.*

Contribution to the literature

This research contributes to:

- Introducing the IDEA framework as an innovative tool for evaluating students' argumentation skills, specifically tailored to static fluid concepts.
- Advancing assessment practices by integrating four essential components: claim generation, evidence analysis, justification, and support into a structured and inquiry-driven evaluation process.
- Providing empirical evidence on the framework's effectiveness, demonstrating strong validity and reliability, and offering actionable insights for educators to address challenges in evidence analysis and support.
- Enhancing inquiry-based science education by fostering critical thinking scientific reasoning, and aligning assessment practices with 21st-century learning objectives.

1. INTRODUCTION

Argumentation is a critical reasoning process involving constructing, analyzing, and evaluating claims supported by evidence [1]–[4]. It is essential in the scientific process, where it aids in hypothesis development, data interpretation, and the debate of competing theories [5]. This reasoning process goes beyond the boundaries of science. It is essential in fostering critical thinking and problem-solving abilities. Argumentation allows individuals to present their ideas clearly, justifying their perspectives logically and coherently [6]. In academic and everyday settings, the argumentation skill proves indispensable, especially when addressing complex societal challenges requiring reasoned discourse to reach balanced solutions [7], [8].

In science education, argumentation is vital in helping students engage deeply with scientific content. By developing the ability to present well-structured arguments, students can support their claims with evidence while considering counterarguments [8], [9]. These skills are foundational to scientific literacy, which includes the ability to evaluate evidence, think critically, and apply scientific knowledge to real-world problems [10]. Moreover, argumentation shifts away from rote memorization and toward a deeper, more meaningful understanding of scientific phenomena [11]. Argumentation helps students connect theory with practice, enhancing their ability to reason through complex issues and make informed judgments. Through argumentation, students not only master the material but also cultivate the intellectual skills necessary for lifelong learning and critical thinking. Ultimately, fostering argumentation in science classrooms prepares students to become informed and analytical thinkers in any field.

Despite the importance of argumentation, traditional assessments often fall short by focusing primarily on factual recall rather than evaluating students' reasoning and argumentation skills. Standardized assessments, such as multiple-choice questions, cannot capture the depth of logical reasoning required for constructing and justifying claims [12], [13]. These assessments fail to provide insights into the cognitive processes that underpin students' ability to argue effectively. The gap in assessment highlights the pressing need for tools that more accurately measure students' argumentation skills, offering a deeper understanding of how students construct knowledge and reasoning. Moreover, these tools should be able to guide educators in tailoring instructional strategies and interventions to enhance students' reasoning abilities and critical thinking [14], [15].

Several studies have developed assessments for argumentation skills. Viyanti *et al.* [16] created a rubric to assess argumentation quality in floating and sinking topics, finding that students struggled with supporting alternative statements. Similarly, Evagorou *et al.* [17] highlighted the widespread use of Toulmin's model for argument assessment but also noted its limitations, particularly its rigid structure when applied to complex arguments. In contrast, Arsyim *et al.* [18] developed a Socio-Scientific Issues-based argumentation assessment for middle school students, demonstrating validity and reliability. Furthermore, Ula and Suyono [19] produced a valid and reliable assessment instrument for argumentation skills in buffer solution material.

While these tools contribute to assessing argumentation skills, they often lack an inquiry-driven component that fosters deeper engagement with scientific concepts. Existing methods, such as rubrics for written arguments, structured interviews, and classroom discussion analyses, primarily focus on evaluating argument structure but may not fully capture the evolving nature of inquiry-based learning [20]–[22]. While offering a structured way to assess arguments, rubrics may fail to capture the dynamic nature of inquiry, which evolves as students engage more deeply with content. Although rich in qualitative data, classroom discussions are challenging to standardize across diverse contexts and learning environments [23].

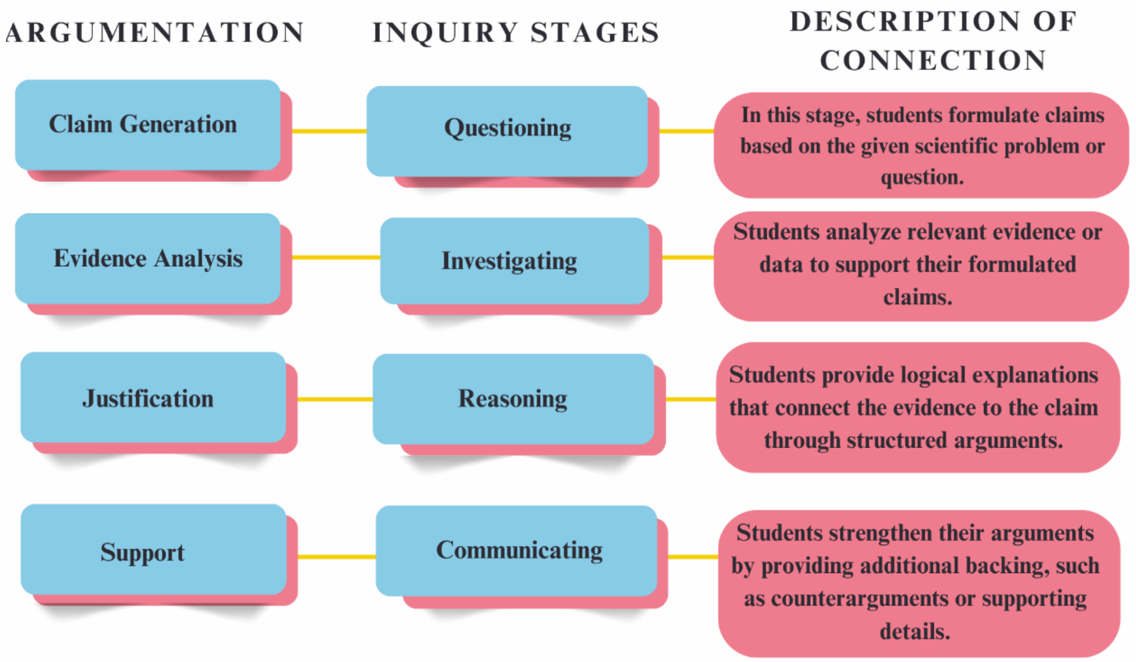


Figure 1. Theoretical Framework Connecting the IDEA Framework with Inquiry Stages

These challenges highlight the need for more innovative assessment tools to evaluate the process and outcomes of students' reasoning [24]. This study introduces IDEA as a novel approach to addressing these gaps. The IDEA was designed to evaluate argumentation skills through an inquiry-based approach. The IDEA framework emphasizes the inquiry process by guiding students to construct claims, analyze evidence, and justify their reasoning, as shown in Figure 1. This approach encourages students to actively engage with the material, fostering critical thinking and active learning [25], [26]. This method not only evaluates the quality of students' arguments but also promotes deeper engagement with scientific concepts, enhancing students' overall reasoning abilities. IDEA aligns with modern educational paradigms that prioritize the development of critical thinking and problem-solving skills, ensuring that students are prepared to navigate complex scientific and real-world issues. By integrating inquiry-based methods into the assessment process, IDEA offers a more comprehensive evaluation of students' argumentation skills, supporting the development of higher-order cognitive skills.

Conversely, the study focuses on static fluid concepts, hydrostatic pressure, buoyant force, and principles of sinking and floating, which are both theoretically challenging and prone to misconceptions [27]. These topics offer a rich context for assessing argumentation skills, as students often struggle to understand the relationship between pressure and depth or the factors influencing buoyant force. Misconceptions in these areas are common, making them an ideal subject for testing the effectiveness of argumentation-based assessments. By incorporating argumentation into the assessment of these concepts, IDEA helps students confront and address their misconceptions, promoting a more accurate and comprehensive understanding of scientific principles [14], [27]. This approach also allows educators to identify specific areas where students may need additional support, ensuring that misconceptions are addressed early in the learning process. Ultimately, IDEA fosters a more accurate application of scientific principles, encouraging students to think critically and develop a deeper understanding of the material.

This study aims to develop and evaluate IDEA's effectiveness in measuring students' argumentation skills within the context of static fluids. By focusing on this fundamental topic in physics, the research seeks to provide insights into how innovative assessment tools can enhance the evaluation and development of students' scientific reasoning abilities. The findings from this study could inform the design of more effective assessment strategies in science education, helping educators better evaluate students' cognitive development and argumentation skills.

2. METHOD

The IDEA development followed the ADDIE model, which consisted of the Analyze, Design, Develop, Implement, and Evaluate stages to ensure alignment with educational goals, as shown in Figure 2. After receiving ethics approval, the research was conducted. In the Analyze phase, the research identified gaps in students' argumentation skills, particularly in physics topics such as static fluids, and defined instructional goals focusing on core concepts like hydrostatic pressure and buoyancy. This phase also incorporated Toulmin's Argumentation Theory to structure the assessment and foster critical thinking by requiring students to generate claims, analyze evidence, and address counterarguments. In the Design phase, the IDEA framework was planned, focusing on claim generation, evidence analysis, justification, and support, ensuring a structured approach to assessing students' argumentation skills. During the Develop phase, the assessment tool was created based on the planned design, considering the question structure that encouraged students to generate claims, analyze evidence, and provide strong justifications. In the Implement phase, the IDEA assessment tool was applied to students to test how much they could complete the assessment tasks and demonstrate their argumentation skills.

Finally, in the Evaluate phase, an evaluation of the validity and reliability of the assessment tool was conducted, along with an assessment of students' argumentation skills. Validity was tested by involving experts to evaluate the alignment of the assessment tool with learning objectives and by using Pearson correlation to measure the relationship between individual items and the overall exam score. Reliability was tested using Cronbach's alpha to ensure the consistency of the assessment tool. Additionally, students' argumentation skills were evaluated to determine whether the assessment effectively measured their abilities to generate claims, analyze evidence, provide justification, and support their arguments appropriately.

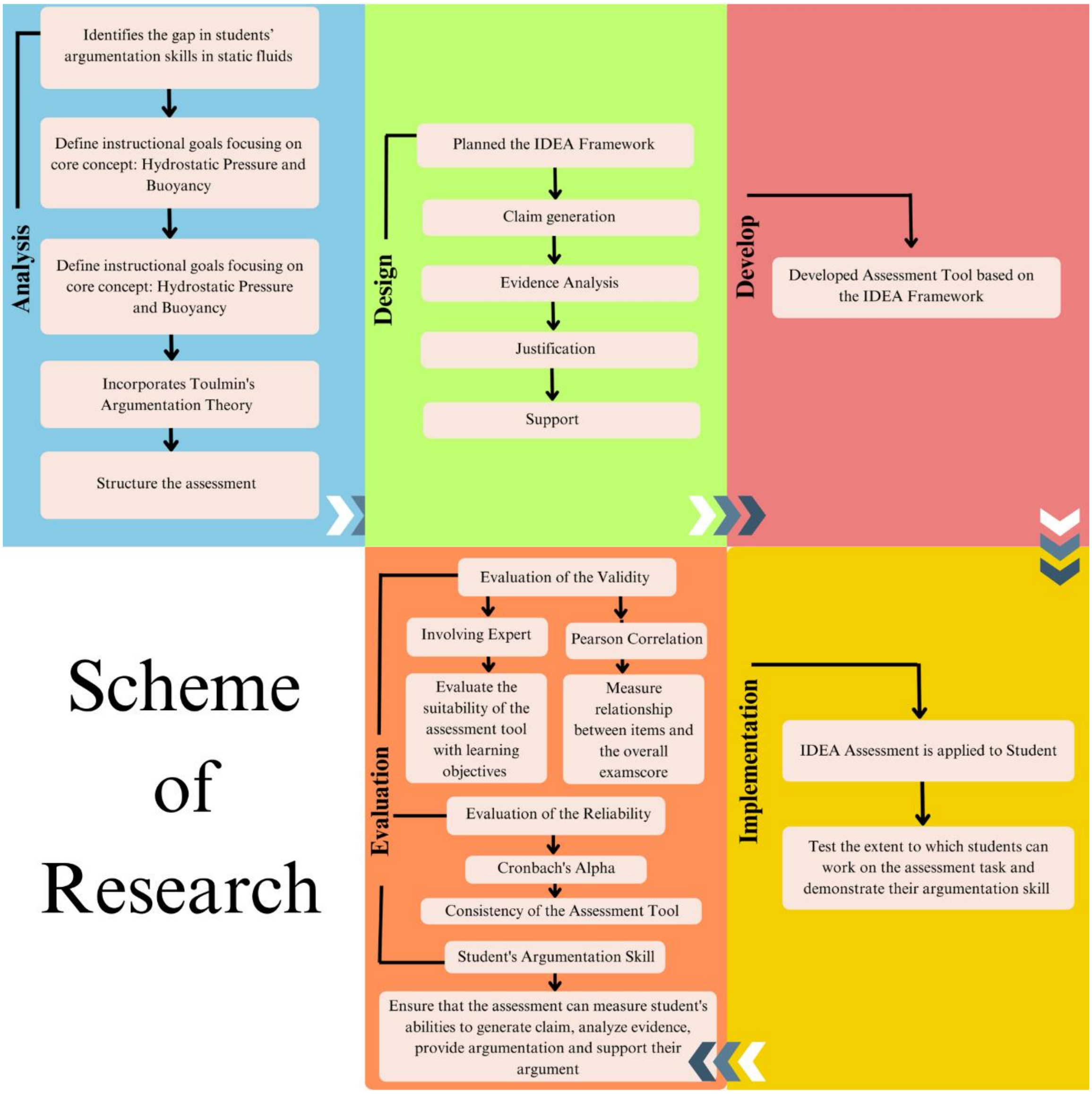


Figure 2. The Scheme of Research

The IDEA was implemented on 26 eleventh-grade high school students from a private school in Bandung who had already studied the topic of static fluids. This ensured that the students had sufficient background knowledge to effectively engage with the assessment tasks and demonstrate their argumentation skills. This controlled classroom environment served as a foundation for assessing the framework's practicality and effectiveness, leading to the subsequent evaluation phase. After receiving consent from parents and students, the research was conducted.

The research instrument used in this study was the IDEA, which was developed to evaluate students' argumentation skills on static fluids, including key concepts such as hydrostatic pressure, buoyancy, and the principles of floating and sinking. The assessment consisted of three questions designed to assess these core concepts and guide students through four essential components of argumentation: claim generation, evidence analysis, justification, and support. The IDEA tool required students to engage in multi-step reasoning, where they generated claims, analyzed and evaluated evidence, justified their reasoning, and supported their arguments with relevant theories or examples.

The data analysis process was anchored in a scoring rubric specifically aligned with the IDEA framework. It was designed to assess students' argumentation skills across its core components: claim generation, evidence analysis, justification, and support, as outlined in Table 1. This structured and consistent evaluation method connected the implementation results with actionable insights, offering a detailed analysis of student performance outcomes for each component while identifying specific strengths and areas needing improvement.

Table 1. Scoring Guide for Each Component

Score	Claim Generation	Evidence Analysis	Justification	Support
1	The claim is unclear or partially addresses the question.	Evidence is minimal or weakly connected to the claim.	Justification is weak or lacks logical connections.	Support is weak or lacks depth.
2	The claim is somewhat clear but contains inaccuracies.	The evidence is somewhat relevant but lacks depth.	Justification is somewhat reasonable but incomplete.	Support is somewhat developed but limited.
3	The claim is mostly clear and addresses the question effectively.	Evidence is sufficient and adequately supports the claim.	Justification is clear and adequately explains the connection.	Support is adequate and adds to the argument.
4	The claim is fully clear, precise, and directly addresses the question.	Evidence is comprehensive, highly relevant, and strongly supports the claim.	Justification is strong, well-reasoned, and clearly explains the connection between evidence and claim.	Support is comprehensive, well-developed, and enhances the strength of the argument.

Each component was scored individually, and the total score reflects the overall quality of the student’s argumentation. The total score was calculated by summing the scores for all four components, resulting in a maximum possible score of 16. The total score provided a holistic view of the student’s argumentation performance, while individual component scores highlighted specific strengths and areas for improvement. The scoring guide ensured a consistent and structured evaluation process, promoting clarity and fairness in assessing argumentation skills.

3. RESULTS AND DISCUSSION

The Analysis phase of this study focused on identifying gaps in current fluid physics education and assessment practices. The review of national physics curriculum standards emphasized essential learning objectives and competencies, ensuring alignment with key fluid physics concepts, such as hydrostatic pressure, buoyancy, and the principles of floating and sinking. The analysis identified student misconceptions, such as misunderstandings about pressure-depth relationships and buoyant force factors, which are significant barriers to conceptual understanding and underscore the need for assessments that promote deeper reasoning [28], [29].

Additionally, a comprehensive evaluation of existing assessment tools revealed that traditional assessments predominantly focus on mathematical problem-solving and numerical accuracy, often neglecting critical reasoning and argumentation skills [12]. These tools primarily require students to compute results or follow procedural steps but rarely challenge them to articulate their reasoning, justify claims, or engage in scientific discourse. This narrow focus limits opportunities for students to construct scientific arguments and defend their understanding using evidence, which is especially problematic for fluid concepts, such as buoyant force or hydrostatic pressure, that demand conceptual reasoning and evidence-based justification [30].

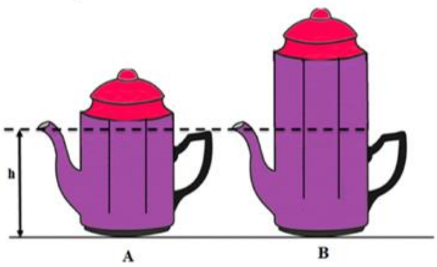
The analysis phase developed question indicators to address these gaps, as shown in Table 2. The indicators were designed to guide students in constructing claims, analyzing evidence, and providing justifications. By integrating these components, the assessment instrument aimed to bridge the gap between traditional assessment methods and the needs of inquiry-based learning, fostering deeper engagement and critical thinking [21], [31]–[33]. Toulmin's Argumentation Theory provided the theoretical framework for developing these indicators. Toulmin's model emphasizes six essential components of an argument: claim, data, warrant, backing, qualifier, and rebuttal, guiding the structure of assessments to require students to generate claims, analyze evidence, justify reasoning, and address counterarguments. This framework ensures the development of coherent and high-quality arguments, aligning with the goals of inquiry-based learning and promoting a deeper understanding of scientific reasoning [34], [35].

Table 2. Identification of Indicators for Each Question.

Question	Indicator 1	Indicator 2	Indicator 3	Indicator 4
1	Stating a claim related to the fundamental law of hydrostatics.	Selecting observational data as evidence to support the claim.	Explaining the justification by describing the relationship between data and the claim.	Explaining the support to strengthen the justification of the claim.
2	Stating a claim related to the concept of buoyant force.	Analyzing observational data as evidence to support the claim.	Explaining the justification by describing the relationship between data and the claim.	Explaining the support to strengthen the justification of the claim.
3	Stating a claim related to floating, sinking, and buoyancy.	Selecting observational data as evidence to support the claim.	Explaining the justification by describing the relationship between data and the claim.	Explaining the support to strengthen the justification of the claim.

During the design phase of assessment development, questions were carefully formulated based on relevant phenomena to promote critical and analytical thinking among students. These questions encouraged students to explore the concepts and seek evidence to support their claims. By presenting data in diverse formats, such as images, tables, and experimental results, students were better equipped to understand the information and make connections to the posed questions. This structured approach fosters active engagement in the learning process. This stage was vital for assessing students' argumentation skills. It provided structured questions and relevant observations, guiding their reasoning process effectively. Figure 3 presents an example of a problem-based scenario designed to stimulate inquiry, prompting students to respond to questions regarding a situation depicted in an image of two kettles, specifically about the water levels in each kettle. Essentially, this assessment design aimed to elicit and evaluate students' ability to construct and defend arguments based on presented information.

Observe the image below!



Problem: Based on the image above, is the amount of water contained in kettles A and B the same or different?

Figure 3. Example of a Problem-Based Scenario to Initiate Inquiry

Figure 4 illustrates an example of observation results data for inquiry-based exploration. Students will utilize the observation results to select evidence pertinent to the claim. This process allows students to connect their direct observations to the formulation of their arguments.

Observation Results
The following observational data are available:

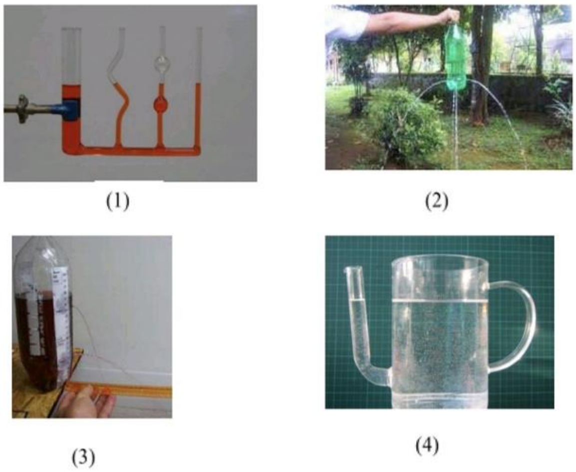


Figure 4. Observation Results as Data for Inquiry-based Exploration: (1) A Setup Showing Water Flow in a Tube; (2) Water Being Poured from a Bottle to Form a Stream; (3) A Bottle with Measured Liquid Level; and (4) A Container with Water Showing Water Level

Figure 5 presents an example of an inquiry-based question that incorporates claims, evidence, and justification. These questions required students to use critical thinking and demonstrate their understanding of the concept while also allowing them to showcase their argumentation skills. Effectively, this type of question acts as a comprehensive assessment of both content knowledge and reasoning abilities.

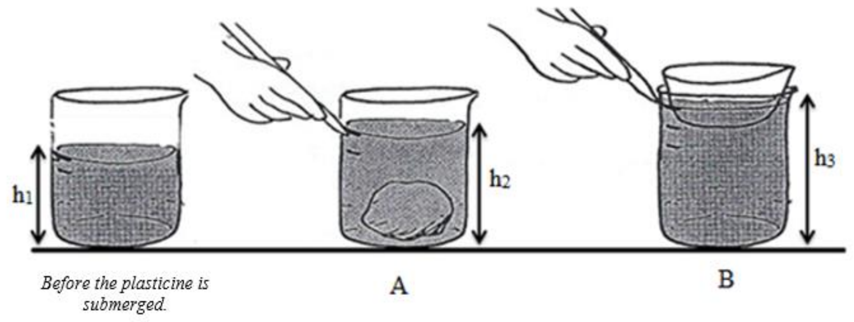
Questions:

a) Write a statement (claim) to answer the problem above!
b) Write the evidence (data) based on observational results that support the statement (claim)!
c) Explain the justification of the evidence (data) you selected in part b to support the statement (claim)!
d) Write the theory that can support the statement (claim)!

Figure 5. Example of Inquiry-based Questions Involving Claims, Evidence, and Justification

In the Develop stage, the assessment tool was developed based on the design made. In this stage, the focus was on developing questions that encouraged students to generate claims, analyze evidence, and provide strong justification. The assessment development is shown in Figure 6.

Observe the image below!



A container filled with water. A piece of plasticine with the same mass is placed into the container as shown in images A and B. The water level after the plasticine is placed in the water is indicated in images A and B.

Problem:
Does the buoyant force experienced by the plasticine in images A and B have the same magnitude or is it different?

Figure 6. Example of an Inquiry-based Question on the Develop Stage

The implementation began with teachers' training, ensuring they understood and could consistently apply the IDEA framework's components: claim generation, evidence analysis, justification, and support. Students were then introduced to the assessment structure, expectations, and strategies for tackling each task. During the assessment sessions, students systematically worked through each framework component to construct coherent scientific arguments while teachers provided observations and feedback to support their progress.

A comprehensive pilot test formed a key part of the implementation. Conducted in two-hour sessions, it involved presenting students with three test items featuring diverse representations, such as images, data tables, and equations related to fluid mechanics concepts. For each question, students were required to generate claims, analyze evidence from the provided data, and demonstrate an understanding of key concepts like hydrostatic pressure, buoyant force, and the principles of floating and sinking. They established connections between evidence and claims, citing data points, interpreting tables, and using mathematical relationships to reinforce their explanations.

In the evaluation phase, this process resulted in the validation and reliability analysis of the test instrument. The questions were then administered to students who had already covered the material being tested. This process helped gather information about the validity and reliability of the testing instrument. Validity was evaluated by consulting experts to assess the alignment of the questions with the learning objectives. Additionally, Pearson correlation coefficients were used to measure the relationship between individual test items and overall test scores. Items with a correlation coefficient (r) greater than 0.7 were classified as valid, indicating a strong alignment with the overall test objectives. Items below this threshold were revised to improve their alignment with the assessment goals, ensuring that each question contributed meaningfully to the instrument's objectives.

Table 3 presents the validity test results, showing correlation coefficients for each item. Items with high correlation coefficients were deemed valid, while those with lower values were revised to better align with the intended constructs. This statistical approach helped ensure the instrument's reliability and effectiveness in assessing students' argumentation skills.

Table 3. Validity Test Result

Number	Correlation Coefficients (r)	Validity Categories
1	0.69	High
2	0.88	Very High
3	0.86	Very High

Based on the construct and content validity results, the questions underwent a thorough revision process, incorporating expert feedback. This input helped identify areas for improvement, prompting revisions to both the content and presentation of the questions. Visual elements were enhanced to better represent the concepts being assessed, as seen in Figures 7, which show improvements in the clarity and visual appeal of the questions.

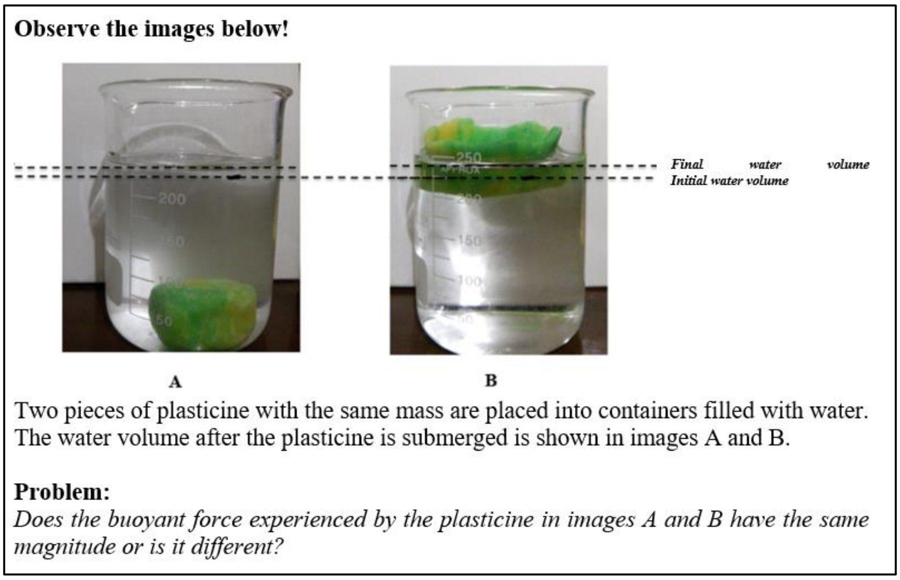


Figure 7. Example of an Inquiry-based Question After Revision

Reliability was evaluated using Cronbach's alpha, which yielded a value of 0.75, indicating satisfactory internal consistency. The instrument, consisting of three descriptive questions, required students to present a claim, provide evidence, justify their reasoning, and offer support. The analysis of student responses revealed students' ability to effectively articulate scientific arguments, although challenges remained in selecting relevant data and fully explaining connections between evidence and theoretical concepts. This data was crucial for refining the assessment tools and ensuring the IDEA framework is better aligned with instructional goals.

Table 4. Reliability Test Result

Reliability Statistic Cronbach-Alpha	N of Items
0.75	3

The performance of each component of the IDEA framework is illustrated in Figure 8. The results show the average scores for Claim Generation, Evidence Analysis, Justification, and Support, revealing areas of strength and weakness in students' argumentation skills. The highest score was in Claim Generation (3.90), indicating students' proficiency in formulating claims. However, lower scores were observed in Evidence Analysis (1.57), Justification (1.96), and Support (1.05), highlighting significant challenges in higher-order reasoning tasks. These findings emphasize the need for targeted interventions to strengthen students' skills in analyzing evidence, providing logical justifications, and offering additional support for their arguments.

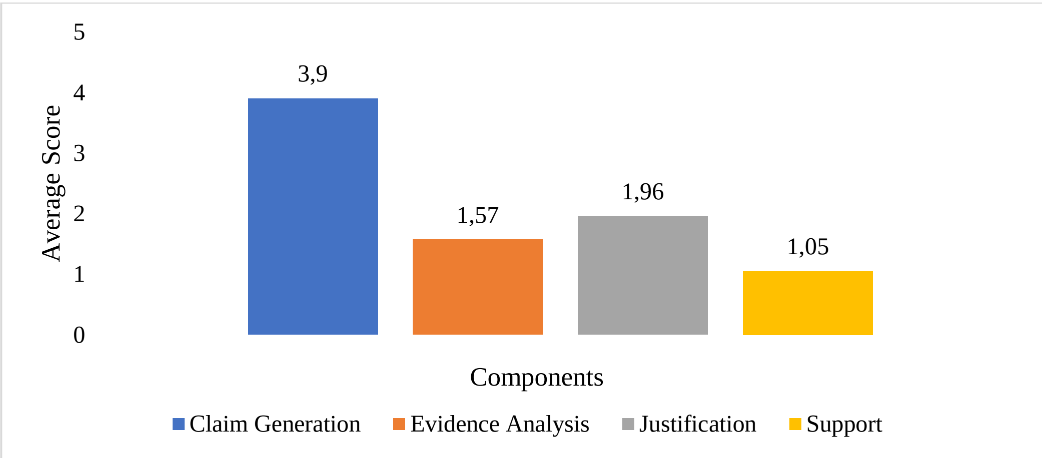


Figure 8. Average Score of Each Component of the IDEA Framework

The diagram presents the average scores for each component of the IDEA framework; they are claim generation, evidence analysis, justification, and support. The highest score was achieved in claim generation, with an average score of 3.90, indicating that students were proficient in formulating claims aligned with the given questions. This aligns with previous studies, such as [36] [37], which suggest that students find it relatively easy to generate claims when well-structured questions. On the other hand, Evidence Analysis scored an average of 1.57, reflecting the challenges students face in interpreting and connecting data to support their claims. These findings consistently noted that students often struggle with analyzing scientific evidence due to limited experience [38]. Justification, with an average score of 1.96, indicates that while students could provide some reasoning, they struggled to fully articulate logical connections between evidence and claims. This observation emphasizes the importance of scaffolding to help students construct coherent justifications [39], [40]. The lowest score, 1.05, was observed in support, highlighting significant difficulties in providing additional backing or addressing counterarguments. Previous research similarly identified support as one of the most challenging aspects of argumentation, often requiring explicit instruction and examples for improvement [6], [13], [41], [42].

These results highlight the necessity of targeted interventions to address gaps in Evidence Analysis, Justification, and Support. The findings validate the use of structured frameworks like IDEA, which enable educators to pinpoint specific areas for improvement. By addressing these challenges through scaffolded activities and explicit instruction, students can develop stronger scientific reasoning and critical thinking skills, aligning with the goals of inquiry-based education. Moreover, the structured nature of the IDEA framework allows educators to systematically assess students' argumentation abilities, ensuring that instructional strategies are tailored to their specific needs.

Building on these findings, this study provides several implications for science education. The IDEA framework offers a structured approach to assessing and developing students' argumentation skills, which are critical for scientific literacy. The results emphasize the importance of incorporating explicit instruction and scaffolding strategies to help students construct well-reasoned arguments. Educators can use these insights to design targeted interventions that enhance students' abilities in evidence analysis, justification, and support. Additionally, the study underscores the role of assessment tools in diagnosing learning gaps and informing instructional practices. Future implementations of the IDEA framework could integrate technology-based feedback systems to further enhance student learning.

However, the study also has limitations. The sample size was limited to a specific student group, which may affect the generalizability of the findings. Furthermore, the study primarily focused on written argumentation, potentially overlooking students' reasoning skills in oral discussions or interactive settings. Future research should explore the framework's applicability across diverse student populations and investigate the impact of real-time feedback mechanisms in improving students' argumentation skills.

4. CONCLUSION

The study concludes that the IDEA framework can be developed using the ADDIE model and serves as an effective tool for assessing and enhancing students' argumentation skills, offering a structured and inquiry-based approach that aligns with the educational objectives of science. The results demonstrate that the IDEA framework effectively evaluates distinct components of argumentation skills, with students showing strong performance in Claim Generation. However, the lower scores in Evidence Analysis, Justification, and Support highlight significant challenges in higher-order reasoning tasks, consistent with previous research. Further research is recommended to refine the IDEA framework and explore its application in broader contexts. Additionally, the findings suggest the need for scaffolded instruction and explicit guidance to address students' challenges in Evidence Analysis, Justification, and Support. Strengthening these areas through structured interventions will help improve students' ability to analyze evidence, provide logical justifications, and support their arguments. This study contributes to inquiry-based education by offering a robust and adaptable assessment tool that aligns with scientific reasoning and critical thinking objectives, promoting deeper engagement with scientific inquiry and preparing students for more advanced reasoning tasks in science education. This research has implications for providing effective evaluation tools to assess and improve students' argumentation skills.

AUTHOR CONTRIBUTION STATEMENT

IS contributed to the original manuscript's conceptualization, methodology, data collection, and writing. NN contributed to the conceptualization, methodology, writing of the original manuscript, templating, and improving and providing input on the research manuscript. NJF contributed to the writing of the original manuscript, templating, improving and providing input on the research manuscript. DA and MGP contributed to improving and providing input on the research manuscript.

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