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Research Article

REDUCTION OF STUDENT MISCONCEPTIONS USING NEARPOD INTERACTIVE LEARNING PLATFORM BASED ON POSNER'S CONCEPTUAL CHANGE THEORY

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Abstract
Misconceptions experienced by students must be identified, reduced, and remediated so that they do not become obstacles for students in their learning process. This study aims to reduce students' misconceptions about static fluids using interactive media developed using the Nearpod Platform based on Posner's conceptual change theory. The research design used was a one-group pre-test post-test design study, by conducting a pre-test, providing actions or treatments, and post-tests to 31 sample high school students. The test instruments and interactive media were first developed with a fairly strict validation process regarding content, construct, and face. Data analysis was carried out using the Wilcoxon Signed Rank Test to measure the effectiveness of the learning platform in reducing misconceptions. Based on the results of the study, it can be concluded that the application of the Nearpod interactive learning platform based on Posner's conceptual change theory can significantly reduce students' misconceptions of the material of hydrostatic pressure and Archimedes' law, with a decrease in the percentage of misconceptions from an average of 34.83% in the pretest to 18.06% in the posttest. Therefore, the Conceptual Change Text strategy through Nearpod media has effectively reduced misconceptions.

Keywords: Conceptual Change, Learning Media Platform, Misconception

INTRODUCTION

Education is a complex process involving communication and the transfer of knowledge, values, and skills from generation to generation (Hussin, 2018; Ramírez-Montoya et al., 2022; Habibi et al., 2024; Halimah et al., 2024; Zakiyah et al., 2024). This process is not limited to formal school environments but also includes informal interactions in society, family, and daily life. More than just delivering instructional content, education is a systematic effort to cultivate deep understanding across disciplines and to shape the values and attitudes that form an individual's character (Arar et al., 2023; Hakim & Darojat, 2023; Rachmanto & Akande, 2024; Anugradia et al, 2025). As noted by Aziizu

(2015) and Jääskelä, Nykänen, and Tynjälä (2018), both formal and informal education significantly contribute to shaping high-quality individuals. Among the various disciplines, physics plays an essential role in this development.

In physics education, teachers are expected to create learning environments that facilitate the scientific process, foster inquiry, and promote deep understanding of scientific concepts (Erlinawati et al., 2019; Etkina et al., 2021; Mardiati et al., 2024; Miharja et al., 2024). Physics presents theoretical frameworks and connects them to real-world phenomena encountered in daily life (Yosua et al., 2019; Sari et al., 2023; Feriati et al., 2025). According to Maknun (2020) and Andini & Kurniawati (2024), physics instruction becomes meaningful when students internalize these concepts and relate them to prior knowledge. However, in practice, students frequently experience misconceptions that hinder accurate comprehension of physics concepts.

Misconceptions, defined as scientifically inaccurate understandings, are a persistent problem in physics learning (Maison et al., 2023). These misconceptions may arise from misleading everyday experiences, insufficient teacher explanations, or misinterpreting learning materials. If not identified and corrected early, such misconceptions persist and obstruct further conceptual development (Potvin & Cyr, 2017; Chen et al., 2020; Yohanie et al., 2023; Sari et al., 2023; Qiu et al., 2025; Sari & Oransa, 2025). In some cases, they even become resistant to change, with students maintaining incorrect beliefs despite being exposed to correct explanations (Setyarini & Admoko, 2021; Wells et al., 2019; Firmansyah et al., 2024; Laksono et al., 2025). One of the most common areas where misconceptions occur is in static fluid topics, especially hydrostatic pressure and Archimedes’ law.

Hydrostatic pressure and Archimedes’ law are fundamental topics in physics that describe everyday phenomena. However, research has shown that students frequently misunderstand these concepts (Maison et al., 2022). Common misconceptions include the belief that: (1) the buoyant force is determined by the object's distance from the surface, (2) hydrostatic pressure directly affects buoyancy, (3) heavier objects sink due to mass alone, and (4) buoyant force depends on the total object volume rather than the displaced fluid. These misconceptions highlight the need for specific pedagogical strategies to target and correct erroneous conceptions.

One proven instructional strategy to address misconceptions is Posner's conceptual change theory, which outlines four essential conditions for change: dissatisfaction with existing conceptions, intelligibility of the new concept, plausibility, and fruitfulness (Amin et al., 2014). When these conditions are met, students are more likely to abandon inaccurate ideas than scientifically accurate ones. This theory has been widely applied in science education (Potvin et al., 2020; Castro, 2025; Galdonez, 2025) and can be enhanced through interactive learning platforms, such as Nearpod. Nearpod is a digital platform that supports engaging learning experiences through features such as quizzes, videos, simulations, and real-time feedback (Sarginson & McPherson, 2021; Acquah, 2025). These features enable active student participation and visualization of abstract physics concepts like hydrostatic pressure and buoyant force, facilitating better conceptual understanding. Moreover, the platform allows teachers to identify and address misconceptions directly through formative assessment.

To guide students through conceptual change, Nearpod-based instruction can follow four phases: (1) identifying students' initial conceptions, (2) inducing cognitive conflict, (3) providing accurate scientific explanations, and (4) facilitating reconstruction of correct concepts (Suma et al., 2018; Sa’diyah & Sukarmin, 2021; Doranggi & Rizka, 2025; Em et al., 2025). Prior studies have validated the effectiveness of Conceptual Change Text (CCT) strategies in similar contexts. For example, Metal et al. (2018) used physical aids alongside CCT to reduce misconceptions in dynamic fluid topics. Suma et al. (2018) found that CCT improved students’ understanding and motivation in electricity concepts.

To enhance the effectiveness of conceptual change instruction, the Nearpod platform offers interactive simulations that support students in visualizing and understanding complex physics concepts, such as buoyant force and hydrostatic pressure. For example, Nearpod simulations can show the pressure difference at the top and bottom of a submerged object, helping students grasp that buoyancy arises from pressure differences, not from absolute pressure at a single point. These visual tools enable students to revise common misconceptions, such as believing that the object's mass or distance from the surface determines buoyancy.

The use of Nearpod can also be structured to align with Posner’s four stages of conceptual change: 1) Dissatisfaction with Initial Concepts: Interactive questions and simulations challenge students’ incorrect beliefs, such as presenting scenarios where large but light objects (e.g., ships) float;

2) Intelligibility: Visual animations demonstrate how fluid density and submerged volume influence buoyancy, making the new concept more understandable; 3) Plausibility: The plausibility of scientific explanations is reinforced through real-time feedback and consistent visual representations; 4) Fruitfulness: Students are encouraged to apply newly constructed concepts to novel contexts, such as explaining why ice floats or how hot air balloons rise. These features make Nearpod an effective tool for supporting conceptual reconstruction, especially when combined with diagnostic assessments and feedback mechanisms.

Despite these findings, few studies have explored integrating conceptual change theory with Nearpod media to specifically reduce misconceptions in static fluid topics. Most prior research emphasizes traditional CCT methods without leveraging the potential of interactive technologies. Therefore, the novelty of this study lies in its integration of conceptual change theory with Nearpod-based instruction to reduce misconceptions about hydrostatic pressure and Archimedes' law. Additionally, using a four-tier diagnostic instrument (Kaltakci-Gurel, 2015) enhances the accuracy of misconception detection. This study aims to examine the effectiveness of Nearpod-based learning informed by Posner's conceptual change theory in reducing students' misconceptions on fluid statics.

RESEARCH METHOD

This study uses a quantitative approach, which is inferential, by drawing conclusions based on the results of statistical hypothesis testing using empirical data collected through measurements (Djaali, 2020; Astalini et al., 2022; Mokoginta et al., 2024; Susana & Nwanya, 2024). The research design used is a one-group pretest-posttest design. This design uses one group, where the dependent variable is measured first through a pre-test. Then, this group is given treatment, and the dependent variable is measured again through a post-test. This design does not involve a comparison group.

Although this study utilized a one-group pretest-posttest design without a control group, several measures were implemented to strengthen the internal validity and ensure that the observed reduction in misconceptions could be attributed to the intervention using the Nearpod platform. First, the interval between the pretest and posttest was relatively short and controlled to minimize external influences. Second, the treatment was highly structured and based on Posner's conceptual change theory, incorporating carefully designed multimedia stimuli to induce cognitive conflict and promote conceptual reconstruction. Third, the four-tier diagnostic instrument used in pretest and posttest ensured consistency in measuring misconceptions, thereby allowing precise tracking of conceptual changes. Lastly, statistical analyses such as the Wilcoxon Signed Rank Test and effect size calculation proved that the changes were not random but likely linked to the instructional intervention. Therefore, despite the design limitations, the methodological rigor supports the conclusion that the treatment significantly reduced student misconceptions.

Thirty-one students from a grade XII science class at a senior high school in Jambi, Indonesia, participated in the study. The participants were aged between 16 and 18. Based on their previous academic records, their cognitive abilities in physics ranged from high to low. This demographic information helps contextualize the study and supports the applicability of the findings to similar student populations. In short, the research procedure began with a preparation stage, which included a literature study to understand the theory of conceptual change and the strategies to be used, a preliminary study, and the development of a five-tier diagnostic test instrument. After the preparation, the research continued to the implementation stage; at this stage, a pre-test was conducted on students to measure their initial conceptions and misconceptions about hydrostatic pressure and Archimedes' law. Furthermore, they underwent a learning session using Nearpod interactive learning media based on Posner's theory of conceptual change. After the treatment, students were given a post-test to evaluate changes in their understanding. Data from the pre-test and post-test were analyzed using Microsoft Excel and SPSS software to determine the effectiveness of the intervention.

Student misconceptions are difficult to identify without the correct and valid instrument. In this study, we used an instrument developed in previous studies through detailed qualitative and quantitative stages to produce a quality instrument (Maison et al., 2022; Maison et al., 2023). Five items from four aspects of the instrument (Table 1) were used to collect pre-test and post-test data and can measure five types of misconceptions (Table 2).

Table 1. Diagnostic Test Question Grid

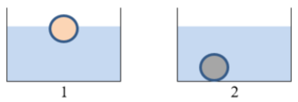
Topics	Assessment Aspect	Question number	Number of Items
Hydrostatic Pressure Archimedes' Law	Relationship between hydrostatic pressure and depth	1, 2	2
	The buoyant force of two objects at different positions	3	3
	Buoyant force due to the volume of fluid being separated	4	
	Buoyancy and density	4	

Table 2. Types of misconceptions

Misconception		Measuring items
Symbol	Description	
M1	The object's distance from the surface determines the buoyancy of an object in a fluid.	1, 2
M2	The magnitude of the hydrostatic pressure determines the buoyancy	1
M3	The buoyancy is determined by the mass of the object	4, 5
M4	The buoyancy is determined by the total volume of the object	2, 4, 5
M5	The buoyancy is determined by the density of the object	3

In Table 2, the instrument used can measure at least five misconceptions, and some items can also measure different misconceptions. For example, Item 2 measures M1 and M4, and Items 4 and 5 measure M3 and M4. This can happen because each item on the misconception instrument has one correct answer choice and several other answers that contain misconceptions.

ITEM 5
First Tier



Two balls have the same volume and are made of wood and iron. The wooden ball floats in water (Figure 1), and the iron ball sinks (Figure 2). The correct statement about the buoyancy of the two balls is
a) $F_1 > F_2$
b) $F_1 = F_2$
c) $F_1 < F_2$

Second Tier
How confident are you in the answers above?
a) Sure
b) Not Sure

Third Tier
The reason for the above answer is
a) The density of the wooden ball is small, so the buoyancy force is large
b) The volume of the wooden ball is the same as the iron ball, so the buoyancy force is the same
c) The wooden ball is partially submerged
d) Other reasons (write down) ....

Fourth Tier
How confident are you in the reasons above?
a) Sure
b) Not Sure

Figure 1. Sample item

Generally, the categories of student conceptions that can be measured using this instrument are Scientific Conception (SC), False Positive (FP), False Negative (FN), Lack of Knowledge (LK), and Misconception (MSC). Decision-making according to these categories is based on students' choices for the first, second, third, and fourth tiers (Table 3). Each row describes a combination of answers (right or wrong), level of confidence in the answer (sure or not sure), reasons underlying the answer (right or wrong), and belief in the reasons (sure or not sure).

Table 3. Student conception categories using four-tier instruments (Kaltakci-Gurel et al., 2015)

First Tier	Second Tier	Third Tier	Fourth Tier	Category
Correct	Sure	Correct	Sure	SC
Correct	Sure	Correct	Not Sure	LK
Correct	Not Sure	Correct	Sure	LK
Correct	Not Sure	Correct	Not Sure	LK
Correct	Sure	Wrong	Sure	FP
Correct	Sure	Wrong	Not Sure	LK
Correct	Not Sure	Wrong	Sure	LK
Correct	Not Sure	Wrong	Not Sure	LK
Wrong	Sure	Correct	Sure	FN
Wrong	Sure	Correct	Not Sure	LK
Wrong	Not Sure	Correct	Sure	LK
Wrong	Not Sure	Correct	Not Sure	LK
Wrong	Sure	Wrong	Sure	MSC
Wrong	Sure	Wrong	Not Sure	LK
Wrong	Not Sure	Wrong	Sure	LK
Wrong	Not Sure	Wrong	Not Sure	LK

Note: Scientific Conception (SC), False Positive (FP), False Negative (FN), Lack of Knowledge (LK), and Misconception (MSC).

After the instrument is applied to the pretest and posttest, scoring is carried out on the correct answers and also on answers containing misconceptions using different answer keys that have been determined previously. Scoring of correct answers on each item is done in the following way: for Tier 1, if the answer is correct based on the answer key, it is given a score of 1, and if the answer is wrong, it is given a score of 0; for Tier 1&3, if the answer and reason are correct it is given a score of 1 and 0 if the answer is not appropriate; for All Tier, if all are correct based on the answer key it is given a score of 1 and not appropriate it is given a score of 0. The scoring method for answers containing misconceptions is done the other way around; if the answer contains misconceptions, it is given a score of 1, and if not, it is given a score of 0. This is done for Tier 1, Tier 1 & 3, and All Tiers as above, noting that if one type of misconception is by more than one item, the score is divided proportionally so that the maximum score remains 1. The percentage of misconceptions experienced by students can be categorized as low, medium, or high (Table 4).

Table 4. Misconception percentage category

Percentage	Category
0% - 33%	Low
34% - 66%	Medium
67% - 100%	High

Data analysis in this study aims to obtain information about students' conceptions before and after being given treatment in the form of learning using the Nearpod interactive learning platform based on Posner's conceptual change theory. Data collected from the pretest and posttest were analyzed using Microsoft Excel and SPSS. Hypothesis testing in this study was conducted to test the statement statistically and determine whether the hypothesis could be accepted or rejected.

The Gain Test measures the increase in student understanding or decrease in student misconceptions before and after treatment is given.

$$\boldsymbol{N-Gain} = \frac{(\boldsymbol{Posttest\ score - Pretest\ score})}{(\boldsymbol{Maximun\ Score - Pretest\ Score})} \quad ...(1)$$

This test provides an overview of how effectively the treatment improves students' understanding. The Wilcoxon Signed-Rank Test is used to see whether the difference in pretest and posttest scores is significant. This non-parametric test is used when data is not normally distributed and helps test whether there is a significant change in students' understanding after the treatment.

RESULTS AND DISCUSSION

Identification of students' misconceptions

Based on the pretest results administered to the research participants, several specific misconceptions regarding hydrostatic pressure and buoyancy were identified among the students. These misconceptions, which emerged directly from students' responses, include: (1) the belief that the distance of an object from the surface determines the buoyancy of the object in a liquid; (2) the assumption that the magnitude of hydrostatic pressure determines buoyancy; (3) the idea that the mass of an object solely determines its buoyancy; (4) confusion between the total volume of the object and the volume submerged; and (5) the belief that the density of the object directly determines the buoyant force (Table 5). These misconceptions were evident in students' explanations and answer choices, reflecting fundamental misunderstandings that must be addressed through conceptual change strategies:

Table 5. Students' misconceptions

Students' misconceptions	Descriptions
The distance of an object from the surface determines the buoyancy of the object in a liquid.	Some students believe that the closer an object is to the surface, the smaller its buoyancy will be, which contradicts the fact that the volume of the submerged object and the density of the liquid determine buoyancy.
The magnitude of the hydrostatic pressure determines buoyancy.	Many students misunderstand the relationship between hydrostatic pressure and buoyancy, assuming that hydrostatic pressure directly determines buoyancy. However, buoyancy depends not on the pressure at a certain point but on the difference in pressure above and below the object.
The mass of the object determines buoyancy.	Students with this misconception assume that objects with greater mass have less buoyancy, even though buoyancy depends on the volume of the submerged object and not solely on its mass.
The total volume of the object determines buoyancy.	Students with this misconception do not distinguish between the total volume of the object and the volume of the object submerged in the liquid.
The density of an object determines buoyancy.	Some students mistakenly assume that an object's density directly determines its buoyant force without considering that the buoyant force is produced by the fluid's weight displaced by the submerged object's volume.

Learning using interactive media

The pretest and posttest results can be seen in Table 6 (Correct Score) and Table 7 (misconception score).

Table 6. Percentage of correct answers for Tier-1, Tier-1&3, and All-Tier for Pretest and Posttest

Item	Tier-1		Tier-1 and 3		All-Tier	
	Pretest	Postest	Pretest	Postest	Pretest	Postest
Item 1	22.58	70.96	22.58	67.74	22.50	64.51
Item 2	48.38	61.29	35.48	58.06	29.03	54.83
Item 3	41.93	70.96	32.25	58.06	32.25	58.06
Item 4	58.06	80.64	25.80	48.38	25.80	48.38
Item 5	38.70	93.54	32.25	64.51	32.25	61.29
Mean	41.93	75.478	29.672	59.35	28.366	57.414

Based on Table 6, the average correct score in the pretest was 41.93%, which increased significantly to 75.47% in the posttest. This significant increase could be due to a better understanding of basic concepts or important facts related to the material, making it easier for them to choose the correct answer without considering the reasons behind it. Furthermore, Tier-1 and 3 had lower average scores than Tier-1 in the pretest (29.67%) and increased to 59.35% in the posttest. The increase in scores here indicates that after the treatment, students were more accurate in choosing answers and better in understanding and explaining the reasons behind their choices. However, complex reasons were still a challenge. Meanwhile, All-Tier had the lowest average score in the pretest (28.36%) and increased to 57.41% in the posttest. The lowest score in All-Tier was because students scored one if the answer and reason were correct and were sure of the answer and reason. The improvement in the post-test shows that the treatment in the form of learning strategies helps students understand the concept better and increases their confidence in providing reasons for their answers. In looking at the results of this analysis, the part that needs to be considered is All-Tier because this is the part that shows the percentage of students who understand the concept well or who experience misconceptions.

In addition to analyzing the average score, students' conceptual understanding of correct answers was also evaluated using the Wilcoxon Signed Rank Test. The results showed a statistically significant increase in scores between the pretest and posttest, with a z value of -2.89, $p < 0.05$, and a small effect size ($r = 0.36$). The average correct score increased from $M = 28.3$ in the pretest to $M = 57.4$ in the posttest. Thus, the results of this statistical test indicate an increase in the percentage of correct pretest and posttest scores on All-Tier. This shows that changes in correct scores do not occur by chance, and the treatment has a positive impact and has succeeded in improving student understanding.

Table 7. Percentage of misconceptions for Tier-1, Tier-1&3, and All-Tier for Pretest and Posttest

Item	Tier-1		Tier-1 & 3		All-Tier	
	Pretest	Postest	Pretest	Postest	Pretest	Postest
Item 1	77.41	29.03	77.41	29.03	51.61	29.03
Item 2	51.61	38.70	45.16	22.58	35.48	22.58
Item 3	58.06	29.03	58.06	22.58	54.83	22.58
Item 4	41.93	19.35	25.80	16.12	16.12	12.90
Item 5	61.29	6.45	38.71	6.45	16.12	3.22
Mean	58.06	24.51	49.02	19.35	34.83	18.06

The table above shows a significant decrease in the percentage of students' misconceptions after the treatment, seen in the pretest and posttest at various tiers for each item. The overall average score results show a significant decrease in the percentage of students’ misconceptions after the treatment, both at Tier-1, Tier-1 & 3, and All-Tier. At the pretest, the average misconception at Tier-1 was 58.06%, which decreased to 24.51% at the posttest, indicating that more students understood the basic concepts after the treatment. At Tier 1 and 3, the average misconceptions also decreased, from 49.02% at the pretest to 19.35% at the posttest, indicating an increase in understanding not only the answers chosen but also the reasons given. The decrease was seen at All-Tier, where the average misconception decreased from 34.83% at the pretest to 18.06% at the posttest, indicating that students became more confident with the correct answers and reasons. These results indicate that the applied learning strategies effectively reduce students' misconceptions and increase in-depth understanding of concepts.

In addition to being analyzed based on the average score, students' misconceptions were analyzed using the Wilcoxon Signed Rank Test. The Wilcoxon Signed Rank Test results revealed a significant decrease in misconceptions during the pretest and posttest. However, statistically, the Wilcoxon Signed Rank Test showed that there was no non-statistically significant decrease (from M = 34.8 to M = 18.0) in pretest and posttest misconceptions after being given additional instructions in the test, z = -2.54, p > 0.05. In other words, the additional instructions given succeeded in reducing misconceptions. However, the decrease was still within limits that were not large enough to meet the statistical significance threshold.

This study aims to analyze the effectiveness of treatment in reducing student misconceptions, improving conceptual understanding, and identifying changes in error categories such as False Negative and False Positive. The results of this study are consistent with previous studies, which revealed that treatment based on the Conceptual Change Text (CCT) strategy can reduce student misconceptions. Previous studies have shown that learning approaches involving active interaction, appropriate feedback, and problem-based strategies can improve conceptual understanding and reduce misconceptions. For example, research by Metal et al. (2018) emphasized that using CCT supported by physical teaching reduces student misconceptions. The results showed that applying Conceptual Change

Text with the help of teaching aids effectively reduced the number of students who experienced misconceptions about fluid material at Senior high school 1 Nanga Mahap, with effectiveness in the moderate category.

In analyzing conceptual understanding, it is also important to identify the various types of errors students make. If students have the correct answer but have the wrong reason, then the student is categorized as False Positive (FP). If students have the wrong answer and the right reason, they are categorized as False Negative (FN). Furthermore, if students still feel unsure about the answer or explanation, they are categorized as students who do not understand scientific concepts (LK). The following are the results of the Comparison of FP, FN, and LK Values in the Pretest and Posttest.

Table 8. Comparison of FP, FN, and LK Scores in Pretest and Posttest

Time	False Positive	False Negative	Lack of Knowledge
Pretest	9.03	8.38	21.93
Posttest	15.48	2.5	7.74

Table 8 shows the comparison of False Positive (FP), False Negative (FN), and Lack of Knowledge (LK) scores in the pretest and posttest. False Positive (FP) is a category where students give correct answers but provide incorrect reasons. In the pretest, the FP score was 9.03, indicating that several students answered correctly, but the reasons they gave were not appropriate. After the treatment, the FP score increased to 15.48 in the post-test. This increase indicates that more students are giving correct answers, but their reasons are still inadequate. False Negative (FN) is a category where students give incorrect answers, but their reasons are correct. In the pretest, the FN score was 8.38, indicating that some students gave incorrect answers even though they had correct reasons. After the treatment, the FN score decreased drastically to 2.5 in the posttest. This decrease indicates improved student understanding, and fewer students give incorrect answers but correct reasons.

Lack of Knowledge (LK) is a category where students still feel doubtful about their answers or explanations. In the pretest, the LK score was 21.93, indicating a high level of doubt among students. After the treatment, the LK score decreased to 7.74 in the posttest. This decrease indicates that the treatment reduced students' doubts and improved their understanding of scientific concepts. The table results show that the treatment successfully reduced students' doubts and misconceptions, improved their understanding, and reduced False Negative category errors. However, there was an increase in False Positives, which needs to be considered for further improvement in learning.

This study shows that the Conceptual Change Text (CCT) strategy supported by interactive media, such as Nearpod, effectively reduces misconceptions in physics learning. Nearpod offers features such as quizzes, simulations, and videos that allow students to be more actively involved online and offline (Nabilah, 2024). The visualizations provided make it easier to understand abstract concepts such as hydrostatic pressure and Archimedes' law (Oktafiani & Mujazi, 2022; Sarginson & McPherson, 2021; Trisahid et al., 2024; Firdaus & Mukhtar, 2025). In addition to facilitating conceptual understanding, Nearpod allows real-time formative assessment, helping teachers directly identify and correct misconceptions. Its interactive features also make learning more enjoyable and motivate students (Oktaviani & Nurhamidah, 2023; Hermanto et al., 2025; Simbolon et al., 2025).

This study makes an important contribution to our understanding of the effectiveness of treatments in improving scientific understanding and reducing students’ misconceptions. By demonstrating that treatments successfully reduced LK scores, this study supports using structured, conceptual, change-based instructional methods to improve students’ understanding. These results add to the existing literature on effective ways to address misconceptions in scientific learning and provide insight into how treatments can be adapted to improve the accuracy of students’ understanding.

Recommendations for future research and practice include expanding the application of Nearpod-assisted conceptual change theory-based learning and exploring the integration of other technologies that can support interactive learning. In addition, further research involving larger samples and longer durations is recommended to gain a deeper understanding of the sustainability of this approach's effects. Regular evaluation of student progress and adjustment of strategies based on feedback is also important to ensure that all students benefit from this method.

CONCLUSION

This study aimed to examine the effectiveness of Nearpod-based instruction, grounded in Posner's Theory of Conceptual Change, in reducing students' misconceptions about hydrostatic pressure and buoyancy. The findings showed a decrease in misconceptions from 34.83% in the pretest to 18.06% in the posttest, accompanied by an increase in correct conceptual understanding from 28.36% to 57.41%. Although the Wilcoxon Signed Rank Test did not yield a statistically significant result ($z = -2.54$, $p > 0.05$), the practical effect size ($r = 0.36$) indicates a meaningful instructional impact. These results confirm that integrating interactive learning technologies like Nearpod can support conceptual change and improve student understanding in science education.

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AUTHOR CONTRIBUTIONS

Conceptualization, Maison; Methodology, Maison, Hebat Shidow Falah, Sri Purwaningsih, Haerul Pathoni, and Hidayati; Investigation, Kinanti Eka Putri; Writing – Review & Editing, Riska Fitriani.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

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