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Misconceptions and Their Remediation on High School Physics Temperature and Heat Materials: A Systematic Review

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ABSTRACT

This study aims to explore misconceptions in temperature and heat concepts in high school physics and analyze the effectiveness of remediation strategies. The objectives of the study are: (1) to identify the concepts most affected by misconceptions, (2) to analyze diagnostic tests frequently used to detect misconceptions, (3) to evaluate the methods/models/strategies used to remediate these misconceptions, and (4) to assess the impact of these strategies on students' conceptual understanding. A systematic review of existing research articles was conducted using both qualitative and quantitative approaches. The results revealed that phase change concepts had the highest percentage of misconceptions (83%), while heat concepts had the lowest (12.42%). The Certainty of Response Index (CRI) was the most commonly used diagnostic tool (57.15%). Effective remediation strategies identified included Conceptual Understanding Procedures, Predict Observe Explain (POE), Problem-Based Learning (PBL), and Problem Solving. The study found that the average effect size of remediation strategies was 2.07, indicating a significant improvement in students' understanding. The findings suggest that targeted diagnostic tests and remediation strategies can effectively reduce misconceptions and improve students' understanding of temperature and heat concepts.

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INTRODUCTION

Physics is learning that focuses on scientific physics concepts combined with mathematical equations. Physics is given to junior high school students (JHS) who are members of science learning, while high school education (SHS) remains under the name of physics. Physics is a subject that is considered difficult to this day, starting from science lessons given to elementary school students to advanced levels. So, in terms of learning Physics, it is known as a misconception. A physics misconception is a student's understanding that is not in accordance with the concept and its application when conducting an experiment. Misconceptions can hinder learning progress (Mufit, 2019) Student misconceptions can be measured using several misconception measurement tools so that it can be clearly measured whether students understand the concept, Physics learning is said to be successful if the objectives of physics subjects can be achieved properly. This can be realized if the teacher conveys the material by relating it in everyday life accompanied by a good understanding of the concept. But in reality, many students are lacking in understanding the concept and even many students have misunderstood the concept. The number of students who have difficulty understanding the concepts of temperature and heat has been seen since junior high or high school and even college (Mufit et al., 2020). Setyadi and Komalasari (2012) found that that from 50 high school students there are 63.7% of students who have misconceptions on the topic of temperature and heat so that they are constrained in understanding the concept. Even the misconceptions experienced on the high criteria. In junior high school students, 70.7% of students experienced misconceptions about the effect of heat in changing the temperature of a substance before learning. After learning, 51.2% of students were still experiencing misconceptions related to the concept (Iriyanti, et al., 2012).

The wrong concept or concept that is not in accordance with scientific statements is called a misconception (Suparno, 2005: 3). Misconceptions can occur because the initial concepts possessed by students are not in accordance with the concepts that should be or students are only presented with theoretical or contextual-based learning which results in students only memorizing formulas without understanding the meaning of the formulas (especially on the material Temperature and Heat). The thing that is most feared is that this misconception can last a long time and is difficult to change or correct during formal education (Mufit, 2018). Errors in understanding concepts or misconceptions will have an impact on Student's attitudes so that they consider physics lessons to be a subject that is feared and difficult to understand (Sri Nurul Wahidah Silung, 2016: 95l; Syahgiah, 2023).

The existing misconceptions should not be left alone because it will have an impact on education. One way to overcome misconceptions is to conduct remediation (Mufit, 2020). Before remediation is carried out, diagnostic tests can be carried out to diagnose Student's misconceptions. Diagnostic tests can be in the form of concept maps, interview tests, and multiple-choice questions. The main purpose of the diagnostic test carried out is to identify problems or difficulties experienced by students in learning and to plan follow-up to the problems experienced and have been identified (planning the implementation of remediation) (Rika, 2020).

Remediation refers to the process of identifying, addressing, and correcting existing misconceptions in learning. In physics, misconceptions are particularly common in topics like temperature and heat, where students often struggle due to incorrect prior knowledge or incomplete explanations during instruction. These misunderstandings can hinder their ability to grasp fundamental concepts and apply them effectively. Targeted remediation strategies are essential to help students overcome these barriers and build a more accurate understanding of the material. Moreover, effective remediation not only corrects misconceptions but also promotes deeper comprehension, enhancing the overall learning experience.

Systematic review is research by analyzing data from several secondary data. Systematic review integrates several similar individual research results to produce findings to understand the rapid development of research. The data collection technique used analysis of national and international journal documents. The objects in this study are all written documents in the form of articles about misconceptions and their remediation of temperature and heat material in high school physics. There are many similar studies on misconceptions and their remediation of temperature and heat material in high school physics, it is necessary to re-analyze the meta-analysis research to conclude the achievement of the research. The results of this study can be a reference for researchers and educators in overcoming the problem of misconceptions in physics learning and knowing how remediation should be carried out (Mufit, et.al, 2020: 269).

This research is research with a systematic review method using quantitative and qualitative approaches. Basically, a systematic review is a research method that summarizes primary research by presenting facts according to the data presented. Therefore, the objectives of this study are (1) to analyze the concept that misconceptions occur in temperature and heat material, (2) analyze diagnostic tests that are often used in diagnosing misconceptions on temperature and heat material, (3) analyze the methods/models/strategies used. to remediate misconceptions on the material of temperature and heat, and (4) analyze the effect of methods/models/strategies in improving students' understanding of concepts on the material of temperature and heat.

METHODS

This research is literature research that uses a systematic study method. This method is designed to collect and analyze primary data from various studies that have been conducted previously. With a systematic approach, this research allows the incorporation of diverse study results, thus providing a broader and significant picture of the topics discussed. The accuracy of the results of this study is supported by a wide range of data and a standardized methodology in analyzing the literature. The articles used in this study meet certain criteria to ensure the relevance and quality of the data. The selected article is a scientific journal that discusses misconceptions and remediation in temperature and heat matter, published in the period from 2010 to 2020.

Other criteria include journals that have gone through a peer review process, published in English or Indonesian, and have data that can be analyzed qualitatively and quantitatively. Articles that do not meet these criteria are excluded from the analysis. The process of selecting articles begins with a search using specific keywords such as "misconception," "remediation," "temperature," and "heat" on databases of leading scientific journals. After that, the articles found are filtered based on abstracts to determine their suitability for the research topic. The relevant article is then examined in-depth on the content and research methods to ensure its validity. This process aims to produce a representative dataset and support the research objectives.

This research consists of five main stages. First, a literature review is carried out to identify relevant research. Second, data from selected journals are collected and compiled systematically. Third, the journals are studied and analyzed to explore the main findings and methodologies used. Fourth, the results of this analysis are interpreted to answer research questions. Finally, all research results are summarized in a comprehensive report. Systematic journal review is done by reading each section of the article in depth, including the introduction, methods, results, and discussion. The main findings are recorded and grouped based on specific themes or categories, such as the type of misconception and the remediation method used. Data analysis is carried out qualitatively to identify patterns and relationships, as well as quantitatively to calculate the percentage or frequency of various findings. This approach ensures that the review is conducted objectively and systematically, resulting in meaningful insights into the topic being researched. The complete stages of the literature review process are presented in Figure 1.

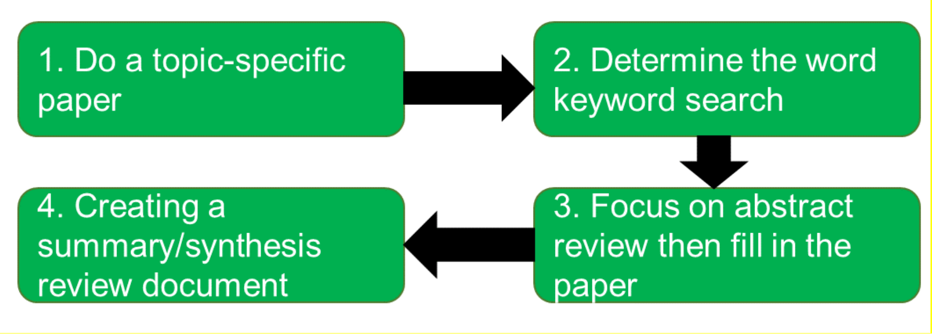

Figure 1. Literature Review Steps

RESULTS AND DISCUSSION

Results

This study examines 19 journals related to student misconceptions, Student's understanding of concepts, and their remediation on high school physics temperature and heat materials covering national journals starting from 2010 to 2020. After identifying 19 journals with different variables, it is obtained some research results which include: (1) concepts that occur in misconceptions on temperature and heat materials, (2) diagnostic tests that are often used in diagnosing misconceptions on temperature and heat materials (3) methods/models/strategies used to remediate misconceptions in materials temperature and heat, (4) analyze the effect of methods/models/strategies in improving students' understanding of concepts on the material of temperature and heat

Table 1. Analysis of Student's Misconceptions on the Material of Temperature and Heat

No	Code	Material	Misconception %
1	A16	specific heat	35
		Effect of heat on objects	44
		Changes in the form of matter	49
		The principle of black	51
		Relationship between temperature and heat	46
		The relationship between heat capacity and temperature	35
2	A17	Expansion of solids	32
		The change of length increases with the change of temperature	44
		Water temperature and anomalies	45
		Phase change	83
		Heat input rate with temperature change	53
		The temperature is divided equally	52
		The relationship between heat capacity and temperature change	82

			30,9
3	A18	Temperature Heat	12,4
		specific heat	36,0
		Change exists	47,0
		Heat transfer	21,2
4	A19	Expansion of solids	53,1
		The change of length increases with the change of temperature	47,9
		Anomalous properties of water	60,9
		Phase change	53,1

In Table 1 it can be seen that students experience failure in understanding concepts or experience misconceptions in the material change of objects (phase) which is 83%, seen more than 50% of students who experience misconceptions. In remediating misconceptions, teachers need to choose specific learning strategies (Rerrysta, 2016:7). While the material that is quite easy to understand is heat material so that Student's misconceptions about the material are 12.42%. One of the causes of misconceptions is the lack of student interest in learning physics and students are accustomed to only memorizing concepts so that the concepts they have just learned cannot be understood (Nursyamsyi, 2018: 54).

The diagnostic tools commonly used to identify misconceptions in temperature and heat topics, as indicated by the analyzed journals, include the Certainty of Response Index (CRI), the Thermal and Transport Concept Inventory, and the Four-Tier Test. These instruments are designed to assess students' understanding and confidence in their responses. The findings of this analysis are visually summarized in the diagram, highlighting the prevalence and effectiveness of each method. The Percentage of Use of Diagnostic Tests in Diagnosing Misconceptions on Temperature and Heat Material is presented in Figure 2.

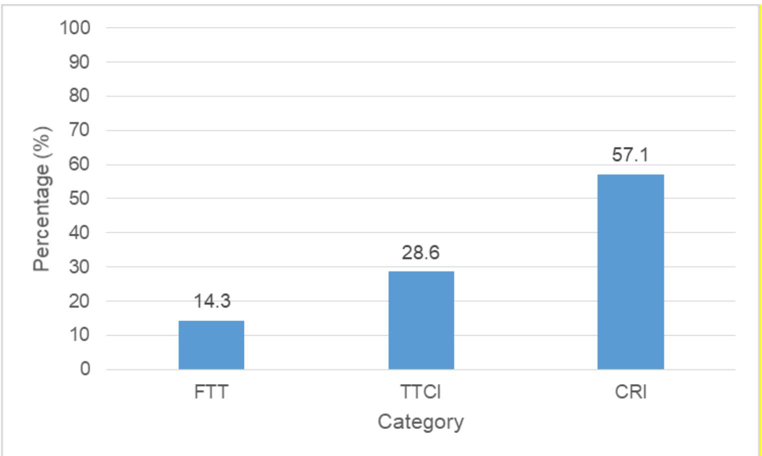

Figure 2. Percentage Diagram of the Use of Diagnostic Tests in Diagnosing Misconceptions on the Material of Temperature and Heat

Figure 2 displays a chart of the percentage use of diagnostic tests in diagnosing misconceptions in temperature and heat matter. There are three categories of methods used, namely FTT (Four-Tier Test), TTCL (Thermal and Transport Concept Inventory), and CRI

(Certainty of Response Index). The results of the review show that the FTT method has a usage percentage of 14.3%, TTCL of 28.6%, and CR of 57.1%. This data indicates that the CR method is the most popular in diagnosing misconceptions in temperature and heat learning. This confirms the effectiveness of CRI in identifying students' understanding of these concepts.

The analysis of methods, models, and strategies for remediating misconceptions about temperature and heat focuses on implementing learning approaches tailored to the conditions of schools and students being studied. Based on the analyzed journals, various strategies have been identified as effective tools for addressing these misconceptions. These strategies are designed to align with the specific needs and contexts of the learners to maximize understanding. This compilation highlights the importance of adaptive and targeted approaches in improving conceptual comprehension in the subject of temperature and heat. A summary of the strategies and methods used in the improvement process is presented in Table 2.

Table 2. Analysis oof Models to Remediate Misconceptions on Temperature and Heat Materials

Code	Author (Year)	Learning Models	Phases Of Learning
A4	Shelly Nurul Marfita (2016)	Model Conceptual Understanding Procedures	1. Students are faced with problems in individual worksheets and understand them within a certain time. 2. Students are given directions to join small discussion groups. 3. Students are directed closer to see all group answers on the blackboard.
A5, A9	Meliyani Hasanah (2015), R. Lebdiana (2015)	Model POE (Predict Observe Explain)	1. Prediction (students pay attention to the phenomena presented). 2. Observe (students observe the changes that occur in the phenomenon with the guidance of the teacher) 3. Explain (students solve the contradictions in the class discussion).
A6	Fitria Alfi Syahrina (2019)	Model PBL	1. Orient the students to the problem. 2. Organizing students to learn. 3. Guide individual and group investigations. 4. Develop and present the work. 5. Analyze and evaluate the problem solving process.
			1. Read and think (Students identify the facts/ concepts/principles involved in the given problem). 2. Explore and plan (Students explore and planning the organization of data

Code	Author (Year)	Learning Models	Phases Of Learning
A7	Noviyanti (2017)	Model Reasoning and Problem Solving	and information). 3. Select a strategi (Students choose a suitable strategy to solve the problem). 4. Find and answer (Students maximize their thinking ability to find solutions. 5. Reflect and explain (Students reflect and investigate the answers that have been collected).
A8	Anon (2016)	Model Direct Instruction Media Assisted Animation	1. Students are divided into several groups and sit in the group. 2. Students are required to think critically about the animation given. 3. Students construct their knowledge through social interaction with other people. 4. Students demonstrate the concepts obtained, if there is an error then it will be corrected after 5. being given LKS under the guidance of the teacher
A10	EW N Sofianto (2020)	Model Problem Solving	1. Students formulate problems and examine according to their knowledge. 2. Students imagine according to the data that has been collected. 3. Students demonstrate the solution of problems that have been taken into account.
A11	Nana (2018)	Model Conflict Cognitive	1. Student orientation to conflict, 2. Organizing students to learn, 3. Guide individual or group research, 4. Develop and present the work, 5. Analyze and evaluate
A12	Ruth Y. Simanungkalit (2015)	Model Guided Discovery	1. Stimulus 2. Problem statement 3. hypothesis 4. Data collection 5. Data processing 6. Verification 7. Generalization
A13	Dedi (2018)	Model Conceptual Change	1. Orientation 2. Idea generation 3. Rearrangement of ideas 4. presented in front of the class

Code	Author (Year)	Learning Models	Phases Of Learning
A14	Ade Radiyas Ponda (2018)	Model Direct Instruction	1. Students are divided into several groups and sit in the group. 2. Students are required to think critically about the animation given 3. Students construct their knowledge through social interaction with other people. 4. Students demonstrate the concepts obtained, if there is an error then it will be corrected after being given LKS under the guidance of the teacher

Table 2 shows the results of the model analysis to correct misconceptions about temperature and heat materials. The diverse learning models outlined in the table demonstrate various approaches to helping students understand concepts of temperature and heat systematically and effectively. The Conceptual Understanding Model emphasizes group discussions and sharing answers to reinforce individual comprehension. The POE (Predict, Observe, Explain) Model encourages students to predict, observe phenomena, and explain findings through class discussions, fostering critical thinking skills. The PBL (Problem-Based Learning) Model guides students to solve problems through a structured process, from problem orientation to solution evaluation. Meanwhile, the Reasoning and Problem-Solving Model trains students to systematically identify facts, plan strategies, and reflect on their solutions, enhancing analytical abilities. These models collectively highlight the importance of problem-based, exploratory, and social interaction-based learning in building a deep understanding of concepts.

The Cognitive Conflict Model prioritizes cognitive adjustments through conflict resolution that drives deep learning. The Guided Discovery Model encourages students to gradually state problems, collect data, and draw generalizations based on their findings. The Conceptual Change Model helps students identify initial ideas, reorganize them, and present them, creating an iterative and reflective learning process. The various phases within these learning models underscore the importance of structured and interactive approaches to enhancing conceptual understanding. Overall, these models provide comprehensive strategies that can be tailored to students' needs and learning conditions to diagnose and address misconceptions in temperature and heat concepts.

Learning strategies play a crucial role in helping students deeply understand the concepts of temperature and heat, especially in addressing common misconceptions. Various strategies have been designed to meet students' needs and learning contexts, focusing on developing critical thinking and problem-solving skills. These strategies involve active approaches such as group discussions, hands-on experiments, and observation of phenomena, which have proven effective in enhancing conceptual understanding. Additionally, each strategy is structured into learning phases to ensure that students not only grasp the concepts but also apply them in diverse situations. The results of the analysis on remediation strategies for misconceptions in temperature and heat concepts are presented in Table 3.

Tabel 3. Analysis of Strategies to Remediate Misconceptions on Temperature and Heat Materials

Codes	Author (year)	Learning Strategies	Phases of Learning
A1	Nila Sari (2017)	Strategy Concept Attainment	1. Data presentation and data identification 2. Testing the achievement of a concept 3. Analyze thinking strategies
A2	Fendy Fermanto (2021)	Strategy Predict – Observe Explain	1. Students make assumptions about an event (predict). 2. Students make observations that must be proven in the experiment (observe). 3. Students explain the results of experiments that have been carried out (explain).
A3	Eni Ratna Sari (2016)	Strategy PDEODE	1. Prediction (students pay attention to the phenomena presented). 2. Discuss I (students discuss the phenomena presented). 3. Explain I (students explain the results of the discussion based on the phenomena presented). 4. Observe (students observe the changes that occur in the phenomenon with the guidance of the teacher) 5. Discuss II (students are asked to analyze, compare, differentiate, and criticize group friends based on the opinions given to the phenomenon). 6. Explain II (students solve the contradictions in the class discussion).

Table 3 shows the results of the analysis of misconception remediation strategies on the material on temperature and heat. The learning strategies outlined emphasize fostering critical thinking and conceptual understanding through structured phases. The Concept Attainment Strategy focuses on guiding students through data presentation, identifying relevant information, and testing the understanding of concepts while analyzing their thinking strategies. This approach is instrumental in helping students identify patterns and refine their reasoning skills. The Predict-Observe-Explain (POE) Strategy, on the other hand, encourages students to hypothesize about an event, validate their assumptions through observations, and explain the outcomes based on experimental evidence. This strategy promotes active engagement with phenomena and strengthens students' ability to connect theory with practice, enhancing their analytical and explanatory skills.

The PDEODE (Predict, Discuss, Explain, Observe, Discuss, Explain) Strategy takes the POE approach further by integrating iterative discussions and explanations to deepen understanding. Students begin with predictions, engage in discussions to analyze phenomena, and provide initial explanations before making observations under teacher guidance. The second phase of discussion and explanation requires students to critically analyze and compare their peers' perspectives, fostering collaborative learning and critical evaluation. This iterative process ensures a thorough understanding of the concepts and helps students address misconceptions effectively. Together, these strategies underline the importance of active involvement, critical analysis, and collaborative learning in enhancing conceptual comprehension and problem-solving abilities.

The analysis of remediation strategies focuses on their impact on improving students' understanding of temperature and heat concepts. Various methods have been applied to address misconceptions and enhance comprehension, with measurable outcomes observed in different learning contexts. These strategies emphasize tailored interventions, such as targeted instructional models and active student engagement. The results highlight the effectiveness of these approaches in fostering deeper conceptual understanding and rectifying prior misunderstandings. The results of the analysis of the influence of improvement efforts on increasing students' understanding of the material on temperature and heat are presented in Table 4.

Tabel 4. Analysis of the Effect of Remediation on Increasing Students' Concept Understanding on Temperature and Heat Materials

No	Journal Code	Author	Percentage of Increase in Students' Concept Understanding (%)
1	A1	Nila Sari (2017)	32.3
2	A2	Fendy Fermanto (2021)	34.0
3	A3	Eni Ratna Sari (2016)	67.0
4	A4	Shelly Nurul Marfita (2016)	27.2
5	A5	Meliyani Hasanah (2015)	11.8
6	A6	Fitria AlfiSyahrina (2015)	23.5
7	A7	Noviyanti (2018)	38.1
8	A8	Anon (2016)	55.3
9	A9	R. Lebdiana (2015)	65.6
10	A11	Nana (2018)	26.5
11	A12	Ruth Y. Simanungkalit (2015)	0.0
12	A13	Dedi (2018)	45.4
13.	A14	Ade Radiasponda	58.0

14	A15	R. Musa'adah (2019)	32.2

From Table 4, it can be seen that after remediation of students' misconceptions on the material of temperature and heat. These results indicate an increase in students' understanding of concepts. Based on the table, it is shown that a researcher by the name of Eni Ratna Sari in 2016 had the highest percentage of increasing student concept understanding, namely 67%. The remediation was carried out using the PDEODE (Predict Discuss Explain Observe Discuss Explain) learning strategy in class X SMA Negeri 8 Pontianak. Meanwhile, Ruth Y. Simanungkalit in 2015 had the lowest percentage increase in student concept understanding, which was 0%. The remediation was carried out using a guided discovery learning model assisted by Student Worksheet in class X SMA Negeri 7 Pontianak. The learning model is carried out by means of students finding problem solving with experiments so that students can find concepts in the material. The application of the applied model makes students have satisfaction with the concepts found.

Discussion

The results of this study reveal the widespread prevalence of misconceptions among high school students regarding the topics of temperature and heat. These misconceptions were identified through a variety of diagnostic methods, such as the Certainty of Response Index (CRI) and a detailed review of related studies. Notably, misconceptions are most commonly found in areas such as the black principle, phase change, and state change. Wulandari (2018) found that 51% of students exhibited misconceptions in the black principle, while Yolanda (2016) reported an even higher percentage—83%—for phase change, and Nursyamsi (2018) found 47% for state change. In contrast, misconceptions in specific heat and the relationship between heat capacity and temperature were less prevalent, at 35% and 12.4%, respectively (Febrianti, 2019). These findings suggest that students struggle more with abstract and conceptual material like phase and state changes, which is consistent with the findings of previous research (Febrianti, 2019; Nursyamsi, 2018).

Several studies highlight that misconceptions related to temperature and heat arise due to various factors, including the abstract nature of the content, the lack of conceptual understanding, and insufficient practical experiences. For instance, phase changes involve complex molecular dynamics that students often find challenging to visualize, which can lead to misconceptions (Nursyamsi, 2018). Similarly, the concept of heat and temperature is often misunderstood because students tend to confuse these two related but distinct concepts (Wulandari, 2018). These difficulties are consistent with studies by Hake (1998) and Sivapalan (2020), who emphasize the need for clear, conceptual instruction and hands-on learning to address such misconceptions effectively.

The diagnostic tools used in this study, particularly the CRI, proved highly effective in identifying and categorizing students' misconceptions. According to Vihavainen et al. (2011), CRI is particularly useful for diagnosing students' understanding levels, allowing educators to distinguish between students who have a solid grasp of the concepts and those who hold misconceptions or misunderstandings. The results indicate that CRI offered a high degree of diagnostic accuracy and could be used as a reliable tool to identify misconceptions in temperature and heat concepts (Nguyen et al., 2019). Moreover, CRI allows for detailed categorization of misconceptions, which helps in pinpointing specific areas that require remediation (Kosasih, 2020). By utilizing such diagnostic tools, educators can better focus their remediation efforts on the most prevalent misconceptions and improve overall student comprehension (Nguyen et al., 2019).

When it comes to remediating these misconceptions, the study found that various teaching strategies and models have proven effective. Among the most frequently used methods were learning models like Predict Observe Explain (POE) and Learning Concept Attainment (PAC), both of which focus on active engagement and critical thinking. According to Arends (2016), POE encourages students to make predictions, observe experiments, and reflect on their observations, which can help in confronting and correcting misconceptions directly. The success of POE in addressing misconceptions in temperature and heat by actively involving students in the learning process (Nana, 2018). Similarly, PAC has been shown to be effective in helping students refine their understanding of scientific concepts by guiding them through the process of constructing and testing their own ideas (Sivapalan, 2020).

Furthermore, the cognitive conflict approach also emerged as an effective strategy for remediating misconceptions in temperature and heat. This method, as outlined by Nana (2018), involves deliberately presenting students with conflicting information that challenges their existing misconceptions, prompting them to reevaluate and correct their understanding (Al Fadhiel, 2024). According to Hake (1998), cognitive conflict approaches lead to deeper learning because students are forced to confront the contradictions in their thinking, thereby facilitating more profound conceptual changes. The results of this study align with these findings, showing that employing a variety of remediation strategies, such as POE and cognitive conflict, can significantly enhance students' conceptual understanding (Sivapalan, 2020).

The positive effects of remediation on student comprehension were clearly evident in this study. The implementation of various remediation strategies led to significant improvements in students' understanding of temperature and heat concepts. These findings are supported by Sandi and El-Hani (2017), who concluded that addressing misconceptions directly leads to better conceptual understanding. The extent of the improvement was influenced by the type of remediation method used. For instance, methods like POE, which emphasize hands-on learning and real-world applications, were particularly effective for topics like heat transfer, while PAC and cognitive conflict strategies worked well for more abstract topics like phase changes and specific heat (Nguyen & Coombs, 2021). This highlights the importance of choosing the right strategy based on the nature of the misconception and the specific content being taught (Mike, 2023).

In conclusion, this study underscores the importance of addressing misconceptions in teaching temperature and heat concepts through the development of appropriate teaching models, diagnostic tools, and remediation strategies. The findings suggest that by accurately diagnosing misconceptions and selecting the most effective remediation strategies, educators can significantly improve students' conceptual understanding of these critical physics concepts. However, one limitation of this study is the reliance on a single diagnostic tool, CRI, which may not capture all aspects of student understanding. Future research could explore the use of multiple diagnostic tools in combination to obtain a more comprehensive understanding of students' learning difficulties. Additionally, while this study focuses on high school students, it would be beneficial to examine the applicability of these remediation strategies at other educational levels, such as middle school or university. Finally, the sample for this study was limited to a specific geographical context, and further research could explore how these findings apply to a broader range of educational systems and cultural settings.

CONCLUSION

Based on the results of the literature review, it can be concluded. First, the concepts of temperature and heat that are misconceptions by students are material expansion of solids, changes in length increase to changes in temperature, anomalous properties of water, phase changes, heat, and the black principle. The highest percentage is 83% with phase change material (change of state of matter). While the lowest percentage is 12.42% with heat material. Second, a diagnostic test that is often used in diagnosing Student's misconceptions about temperature and heat is CRI (Certainty of Response Index). Third, remediating Student's misconceptions on the material of temperature and heat can be done by changing the method or model in learning. The remediation carried out mostly changes the model in learning, including: Conceptual Understanding Procedures, Predict Observe explain, PBL, Problem Solving, and others. Fourth, the remediation carried out can reduce misconceptions or can be said to increase students' understanding of concepts. A researcher by the name of Eni Ratna Sari showed this increase by obtaining the highest percentage of 67%.

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