JURNAL PEMBELAJARAN FISIKA
http://jurnal.fkip.unila.ac.id/index.php/JPF
VOL. 12 (1), JUNE 2024, 95-111 || P-ISSN 2302-0105, E-ISSN 2684-9828
LITERATURE REVIEW

Analysis of Understanding Concepts and Misconceptions in Physics Learning: SLR (Systematic Literature Review)

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Article History

Received:
23 October 2024

Accepted:
27 December 2024

Published:
31 December 2024

Keywords

Misconceptions, physics learning, tiered diagnostic tests, understanding concepts.

Abstract

An educator often faces the challenge of ensuring that students truly understand the concepts taught or not, especially in physics learning. As one of the branches of science, physics aims for students to be competent in mastering the principles and concepts of physics. Misunderstanding of concepts will certainly hinder learning objectives so concrete steps are needed to overcome misconceptions. If misconceptions can be overcome, this will have a positive impact on students' conceptual understanding. This study aims to analyze conceptual understanding and misconceptions in physics learning. The method used is the Systematic Literature Review (SLR) through the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) procedure. This study analyzed 24 national articles accredited by sinta 1, sinta 2, and scopus that discussed students' conceptual understanding and misconceptions in physics learning. The results showed that using innovative learning models such as the Learning Cycle (LC) 7E, generative learning, and guided inquiry significantly improved students' conceptual understanding. In addition, the development of modules based on Science, Environment, Technology, and Society (SETS) and the use of technology such as E-LKPD based on the Physics Toolbox Sensor Suite proved effective in strengthening the understanding of physics concepts. On the other hand, misconceptions are still widely found in the basic concepts of physics, which are identified through the Three-Tier Test and Four-Tier Diagnostic Test. Therefore, the selection of the right learning model and the use of technology in teaching are key factors to reduce misconceptions and improve students' understanding of physics.

DOI: http://dx.doi.org/10.23960/jpf.v12.n2.202403

INTRODUCTION

Physics learning in secondary schools often faces challenges in ensuring students truly understand physics concepts well. One of the main problems that usually arises is misconception, namely an error in understanding a scientific concept supported by reasonable arguments. Misconceptions are usually rooted in incorrect initial understanding. The gap between existing concepts and scientific concepts will have a negative impact or hinder the learning process (Kuczmann, 2017; Resbiantoro et al., 2022; Subayani & Nugroho, 2019). In line with what (Artiawati et al., 2016) said in their research, if misconceptions continue to occur, this will become an inhibiting factor in the formation of scientific concepts in students and will disrupt the learning process in the classroom.

Various learning methods have been applied by physics teachers to improve students' understanding of concepts, ranging from traditional lecture methods, group discussions, and problem-based learning, to the use of technology in the classroom such as computer simulations and interactive videos (Pebriyanti et al., 2017). Each learning method has a different approach to delivering material and involving students in learning. More interactive and participatory learning methods, such as problem-based learning, can increase students' conceptual understanding more effectively than conventional methods (Djalal, 2017). On the other hand, inappropriate learning methods can exacerbate existing misconceptions or even create new ones. Therefore, it is important to identify various learning methods that influence students' conceptual understanding and how these methods can help overcome or strengthen students' misconceptions.

Understanding concepts is one of the goals in the learning process, especially in physics learning which is abstract and requires critical thinking skills. As a branch of science, physics aims to make students competent in mastering the principles and concepts of physics. Apart from that, it is important to form an attitude of self-confidence and develop knowledge skills (Affandy et al., 2019). The indicators used to determine students' conceptual understanding in the reviewed articles mostly use indicators from Anderson and Krathwohl, namely the 7 aspects of interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. In essence, a good understanding of concepts encourages students to be able to connect concepts and principles from one source to another, so that it can become a provision for students to solve daily life problems in the form of solutions based on understanding the concepts they have learned (Tanjung & Mufit, 2023).

Besides that, it is not uncommon for students to experience misunderstandings when understanding a concept. Misunderstandings in understanding concepts can occur because students are not familiar with scientific concepts in their environment, and students themselves experience misunderstandings (Kamal & Mulhayatiah, 2019). There are two tests used to measure misconceptions in the reviewed articles to identify misconceptions in students, namely the Three Tier-Test and the Four Tier-Diagnostic Test. Meanwhile, to identify misconceptions in textbooks, the content analysis method is used.

Systematic Literature Review (SLR) is a process that aims to provide comprehensive answers by collecting and analyzing existing literature. This method emphasizes the collection of evidence from quality and relevant research. The steps taken when using this method are planning, implementation, and reporting (Latifah & Ritonga, 2020). The data reviewed is of course relevant to the discussion in this article. Through this approach, SLR aims to present better information related to the understanding of a particular topic.

Previous research using the Systematic Literature Review (SLR) method as carried out by (Ayu et al., 2022; Fadilla et al., 2022) in previous research discussed how one learning model can improve student learning outcomes and increase students' understanding of concepts. Apart from that, in (Fadilla et al., 2022) the focus of the research is how learning models influence student learning outcomes. The research conducted by (Ahlamy et al., 2022) focused on appropriate learning models to increase students' understanding of concepts in rotational dynamics material. These three studies did not further analyze the criteria for learning models that can be used as concrete steps to increase students' understanding of concepts while reducing students' misconceptions.

To find out the criteria for a suitable learning model, it is necessary to conduct a literature study with a wider scope. Not only focusing on one physics material or only on learning models but examining several learning models that are applied during the learning process in various physics materials. Therefore, criteria for suitable learning methods are obtained to reduce the risk of misconceptions and increase students' understanding of concepts.

Based on this background, this research was carried out to identify the learning model used to understand students' concepts and how the learning model had an impact on students' misconceptions. It is hoped that the results of this research can provide guidance for physics teachers in choosing the most effective learning methods to increase student understanding while reducing the risk of misconceptions arising.

METHOD

This study uses the Systematic Literature Review (SLR) method with systematic research techniques to collect, assess, and analyze studies relevant to a particular research topic. This approach aims to summarize existing research results in a comprehensive and structured manner, providing a clearer picture. The articles reviewed were obtained through scientific journals accredited by Sinta 1, Sinta 2 and Scopus. The data were obtained on September 20, 2024. The keywords used in the data search were "misconception" AND "conceptual understanding" AND "learning" AND "physics" AND "graded diagnostic tests". The articles used focused on conceptual understanding and misconceptions experienced by students. The software used for literature management is Mendeley. There are 11 articles related to conceptual understanding and 13 other articles related to student misconceptions. These articles were studied in more depth and then concluded the study results are in the conclusion section.

Search Strategy

The initial search for articles focused on two databases, namely Scopus and Sinta with the website sinta.kemdikbud.go.id to search for Sinta 1 and Sinta 2 articles. The focus of this study limited the range of new article years to the last ten years from 2014 to 2024. The articles used as review materials were referred to in September 2024 using the search terms misconceptions, conceptual understanding, learning, and physics. Table 1 shows the search strategy created:

Table 1. Search Strategy

Databases	sinta.kemdikbud.go.id
	scopus
Search	sinta.kemdikbud.go.id and scopus:
	Title-abs-glass key (“conceptual understanding” AND “misconception” AND “physics” AND “education” AND “science”)
Publication period	2014-2024
Data is accessed	September 2024

Screening Criteria

Participation and exclusion criteria are established to ensure the review is conducted using a proper literature study. Articles that meet the inclusion criteria will be maintained for further screening, while articles with exclusion criteria will be separated and deleted. This screening can be seen in the PRISMA procedure diagram. Table 2 shows the calculation of inclusion criteria and exclusion criteria.

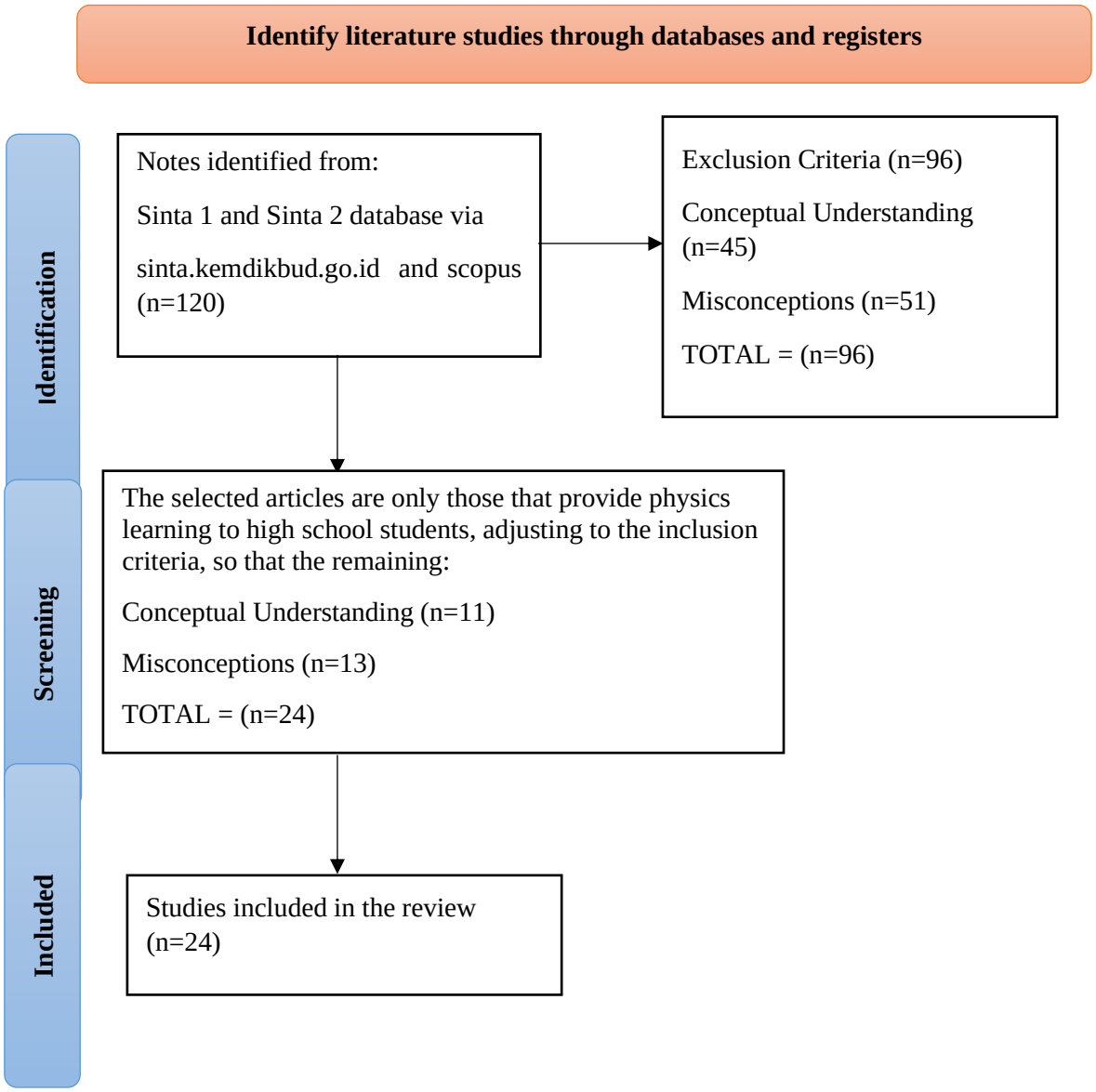
Table 2. Inclusion and Exclusion Criteria

	Inclusion Criteria	Exclusion Criteria
IC 1:	Year of publication between 2014-2024	EC 1: Published before 2014.
IC 2:	This research is related to physics, high school, learning, conceptual understanding, and misconceptions.	EC 2: Research not related to physics and high school.
IC 3:	Articles are open access.	EC 3: Article is not open access.
IC 4:	Articles accredited with sinta 1 and sinta 2	EC 4: Articles are not accredited by sinta 1 and sinta 2

Data Extraction and Analysis

The initial step taken to search for reviewed articles related to the topic discussed by entering keywords in the database. The search results from the sinta.kemdikbud.go.id database obtained 56 articles related to conceptual understanding and 64 articles related to misconceptions with the keywords "conceptual understanding" AND "science" AND

"education" AND "physics" AND "misconception" AND "science" AND "education" AND "physics". After filtering, only 11 articles with the context of conceptual understanding and 13 articles with the context of misconceptions were included in the inclusion criteria.



Picture 1. PRISMA Flow Diagram

RESULT AND DISCUSSION

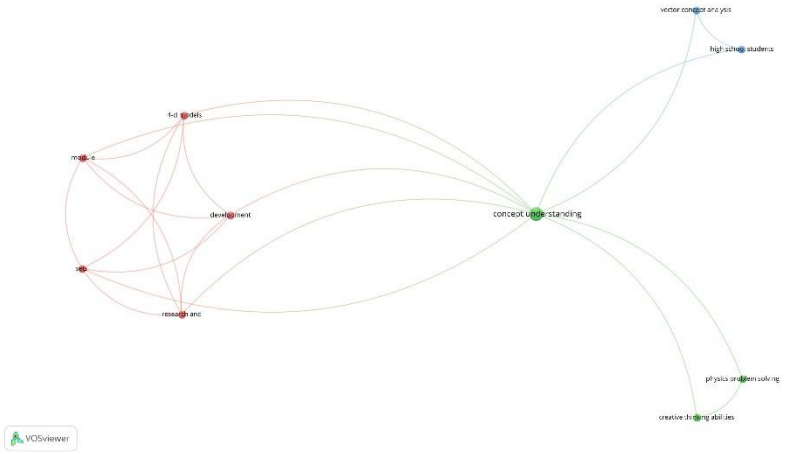
In this SLR approach, 11 articles were analyzed related to students' understanding of concepts when applying the learning model, and 13 articles were related to misconceptions experienced by students in understanding physics concepts.

Table 3. Review Results of Articles Related to Understanding Physics Concepts

No	Identity article	Key findings	Instrumentation
1	(Irwandani, 2015) The Influence of Generative Learning Models on Understanding Physics Concepts on the Subject of Sound for MTS Al-Hikmah Bandar Lampung Students.	Generative learning models can further improve students' understanding of concepts compared to conventional learning models.	Pretest-Posttest Control Design.
2	(Lisma et al., 2017) Application of the 7E Learning Cycle (LC) Model as an Effort to Increase Conceptual Understanding of Interpreting and Concluding Aspects in Class X SMA Calorie Material.	The increase in students' conceptual understanding with an N-gain of 0.78 is in the high category.	One group pretest posttest design.
3	(Fitri, E., & Sari,P., 2017) Identify Students' Conceptual Understanding of Substances and Their Forms.	Aspects of interpreting 59%, inferring 43%, comparing 40%, and explaining 28%.	The test is in the form of multiple choices.
4	(Trianggono, 2017) Causality Analysis of Understanding Concepts with Students' Creative Thinking Abilities in Solving Physics Problems.	Shows a fairly high relationship between understanding concepts and creative thinking abilities (>90%).	Pre-test and post-test.
5	(Sari et al., 2017) Analysis of Understanding Vector Concepts in High School Students.	Students' conceptual understanding is assessed as moderate based on the percentage of conceptual understanding results above 30%, namely 39.1%.	A matter of choice plural and reason for the question required.
6	(Herimanto et al., 2018) Application of the Guided Inquiry Learning Model to	Increase in understanding of concepts in the medium category N-gain=0.47.	One group pre-test post-test design.

	Improve Class VII Students' Understanding of Concepts in Measurement Material.		
7	(Sitepu et al., 2019) Analysis of Vocation School Students' Ability in Conceptual.	Students' conceptual understanding is still low, so a conceptual understanding approach needs to be applied to learning.	Essay test with 6 questions and interview.
8	(Nisyah et al., 2020) Inquiry learning model with advance organizers to improve students' understanding on physics concepts.	The inquiry model combined with an advanced organizer is effective in increasing students' mastery of concepts, with an N-gain of 60.4% in the experimental class and 24.8% in the control class.	Pretest-posttest control group.
9	(Fitri et al., 2021) The Development of a Physics Module Based on the SETS Learning Model to Improve Students' Conceptual Understanding.	The SETS developed was categorized as very valid with an average of 82,16 and for understanding the concept students got a score of 94,67.	Questionnaire validity, practicality, and description of context understanding.
10	(Distrik & Wulandari, 2024) The Effect of E-LKPD Based on Physics Toolbox Sensor Suite on Simple Harmonic Motion Material on High School Students' Understanding of Physics Concepts.	The effect size test result was 1,319, showing that the Physics Toolbox Sensor Suite-based E-LKPD had a big influence on understanding the concept.	The experimental and control classes. Data were analyzed using n-gain, independent sample t-test, and effect size.
11	(Hidayati et al., 2024) The Effectiveness of Digital Module Based-POE (Predict Observe-Explain) with Computer-	The increase in students' conceptual understanding was in the medium category with an N-gain for the experimental class of 0.58 and for the control class of 0.30. Digital module-	Pre-test and post-test.

	Assisted Feedback to Improve Student Understanding of Physics Concept.	based POE with computer-assisted feedback effectively improves conceptual understanding of physics.



Picture 2. Visualization Of Research Connectedness in Table 3

Picture 2. It is a network visualization created using VOS viewer; this visualization shows the relationships between various keywords in the research, with nodes representing the keywords and edges representing the connections between them. Node size and edge thickness indicate the strength of the relationship. Based on picture 2, it can be seen that the primary keyword is concept understanding; this keyword is at the center of the network and is connected to several other keywords, which shows that this keyword is the central theme in the research being analyzed. The green cluster focuses on the keywords physics problem solving and creative thinking, where this cluster shows the relationship between understanding concepts and the ability to think creatively and solve physics problems. The blue cluster refers to analyzing the vector concept and its application to middle school students. In addition, the red cluster shows the relationship between the development of 4-D models, modules, and sets in the research context.

Based on the review results of the articles in Table 3, it was found that in a study conducted (Irwandani, 2015) it was explained that the use of generative learning models provided a good increase in students' conceptual understanding when compared to conventional learning models. This shows that students who are involved during the learning process will be encouraged to understand physics concepts, especially in sound material. In addition, an increase in students' conceptual understanding also occurred when the Learning Cycle (LC) 7E model was applied according to the research results (Lisma et al., 2017). The application of the Learning Cycle (LC) 7E model provided a significant increase in the aspects of interpreting and concluding with a high N-gain value. Students' conceptual understanding increased after the LC 7E model was applied because the learning stages in this model provided opportunities for students to practice improving their ability to understand concepts. (Herimanto et al., 2018) Guided inquiry learning

models with pre-experiment methods can improve students' conceptual understanding in the moderate category. There are indicators used as references such as interpreting, exemplifying, explaining, comparing, and classifying. Guided inquiry provides an overview of the increasing level of student activity and student understanding. Addition, other research has found that the inquiry model combined with an advanced organizer is effective in increasing students' mastery of concepts (Nisyah et al., 2020). (Fitri et al., 2021) used the development of a physics module based on the SETS (Science, Environment, Technology, and Society) learning model to determine its effect on students' conceptual understanding. The results of their study showed that the module was effective in improving students' understanding of physics concepts, especially in the aspects of interpreting, exemplifying, explaining, and comparing.

Students' conceptual understanding can not only be improved through the use of learning models. Conceptual understanding can also be influenced through approaches to learning. The use of E-LKPD based on the Physics Toolbox Sensor Suite has an impact on improving students' conceptual understanding of simple harmonic motion material (Distrik & Wulandari, 2024). Students' conceptual understanding related to the material of substances and their forms, was found that students' conceptual understanding was low in the aspect of explaining so further strengthening was needed in learning (Nuraeni & Luritawaty, 2017). (Trianggono, 2017) showed a relationship between conceptual understanding and creative thinking skills in solving physics problems. Deep conceptual understanding will encourage students to think creatively in the context of solving physics problems. (Sari et al., 2017; Sitepu et al., 2019). Both of these articles analyze students' conceptual understanding abilities. (Sari et al., 2017) shows that high school students' conceptual understanding is in the moderate category. Meanwhile, (Sitepu et al., 2019) emphasize the low conceptual understanding ability of vocational school students.

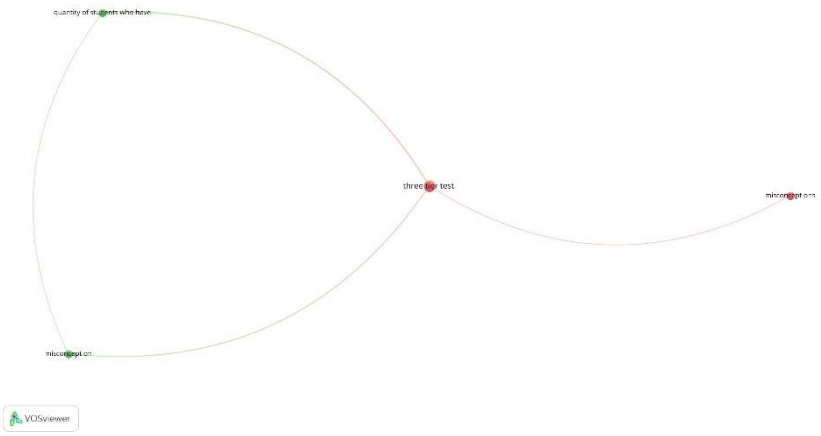
Overall, improving students' understanding of physics concepts is greatly influenced by the selection of the right learning model, the use of supporting technology, and the existence of an approach that actively involves students in the learning process. Innovative and experimental-based approaches and technology have an important role in strengthening conceptual understanding. (Rapi et al., 2022) said that good conceptual understanding and critical thinking skills will make it easier for students to understand or solve contextual problems in physics learning.

Table 4. Results of Review of Articles Related to Misconceptions of Physics Concepts

No	Identity article	Key Findings	Diagnostic Methods
1	(Alhinduan et al., 2016) Identification of Students' Misconceptions Using Three Tier-Test on Dynamic Electricity Material.	Through the three tier-test, the highest quantity of misconceptions was 44,83% and the lowest was 10,38%.	Three Tier-Test
2	(Artiawati et al., 2016) Identification of the Quantity of Students with Misconceptions Using the	Through the three tier-test, the largest misconception was 68% and the lowest was 20%.	Three Tier-Test

	Three Tier-Test on Uniform Linear Motion (GLB) Material.		
3	(Maulini et al., 2016) The Three-Tier Test to Reveal the Quantity of Students' Misconceptions on the Concept of Spring Force.	There is a misconception with a percentage of 40%.	Three-Tier Test
4	(Khoiri et al., 2017) Identification of Misconceptions in High School Physics Textbooks for Grade X on the Topic of Straight-Line Kinematics.	There are misconceptions in some school physics textbooks with university books with a percentage of 10%-20%.	Analyzing data in a high school physics textbook then compare it with a university physics textbook.
5	(Sholihat et al., 2017) Identification of Misconceptions and Causes of Students' Misconceptions Using the Four-Tier Diagnostic Test on the Sub-Material of Fluid Dynamics: The Principle of Continuity.	By using the four-tier diagnostic test to increase the level of confidence in the answers to the three tier-test, it was found that there were 28% of students who had misconceptions.	Four-Tier Diagnostic Test
6	(Maulini et al., 2017) The Three-Tier Test to Reveal the Quantity of Students' Misconceptions on the Concept of Spring Constant.	By using the three tier-test, it was found that there were 40% misconceptions in concept 1 and 37.5% in concept 2.	Three-Tier Test
7	(Minarni et al., 2018) Identification of the Quantity of Students Who Have Misconceptions about Dynamic Electricity Material Using the Three Tier Test (TTT).	Through the Three Tier-Test (TTT), the quantity of students with misconceptions was obtained, namely 23%-67%.	Three Tier-Test
8	(Nurdiansyah et al., 2018) Misconceptions of Physics Textbooks for Senior High School Grade X on the Topic of Motion Dynamics.	There are misconceptions in physics textbooks with different percentages of aspects. Starting from 10% -% 7,14%.	Analyzing data in a high school physics textbook then compare it with a university physics textbook.
9	(Artiawati et al., 2018) Identification of the Quantity of Students with	Using the three-tier test on concept 1, the percentage of misconceptions was 47%, and on	Three-Tier Test

	Misconceptions Using the Three-Tier Test on the Material of Uniformly Accelerated Linear Motion.	concept 2 it had a percentage of 90%.	
10	(Annisa et al., 2019) A four-tier diagnostic test to identify students' understanding and misconceptions about the material of regular circular motion.	By using the four-tier diagnostic test, it was found that this test can be used to detect students' conceptual understanding and misconceptions.	Four Tier-Test
11	(Kesuma et al., 2020) Blended Learning Model: Can It Reduce Students' Misconception in Physics?	The percentage of misconceptions before the blended learning model was implemented was 54.90%, and after being tested with this learning model, students' misconceptions decreased to 22.04%.	Four Tier-Test with CRI (Certainty of Response Index)
12	(Erwinsyah et al., 2020) Development of the Four-Tier Diagnostic Test to determine students' conceptual understanding of linear motion material.	The four-tier diagnostic test can be used to detect the profile of students' conceptual understanding, as many as 15,57% of students have misconceptions.	Four Tier-Test
13	(Martawijaya et al., 2023) The Effect of Applying the Ethno-Stem-Project-Based Learning Model on Students' Higher-Order Thinking Skill and Misconception of Physics Topics Related To Lake Tempe, Indonesia.	There was a decrease in the level of misconceptions, with the number and percentage of students in the low, medium, and high classes decreasing, respectively, 12 (30.77%), 14 (35.89%), and 13 (33.33%).	Three Tier-Test



Picture 3. Visualization Of Research Connectedness in Table 4

Picture 3. It shows the relationship between keywords, such as the Three Tier Test, which is connected to the keywords Misconceptions and Quantity of Students Who Have, showing that this three-tier test identifies student misunderstandings. Misconceptions are connected to the Quantity of Students Who Have, indicating a focus on identifying and analyzing misconceptions among students. This visualization provides a clear picture of how the various concepts in the research relate to each other. By examining these relationships, researchers can identify areas that require further attention, discover patterns in the data, and develop new hypotheses based on the identified relationships.

The results of the review of articles related to students' misconceptions about physics concepts are in Table 4. It was found that in identifying misconceptions, diagnostic tests can be carried out using the Three Tier Test (TTT) or Four Tier Test instruments for misconceptions in students and content analysis methods to find out misconceptions in teaching materials or textbooks. Based on the analysis conducted in the study (Alhinduan et al., 2016; Minarni et al., 2018) both of these articles used diagnostic tests with the Three Tier-Test (TTT) method to identify misconceptions in dynamic electricity material. The results of the study (Minarni et al., 2018) found that the majority of students had misconceptions about the concept of "electric current" with a percentage of 97%, (Minarni et al., 2018) this misconception occurred because the teacher mastered delivering the material was still low. Teachers have difficulty visualizing microscopic phenomena in the form of words, in addition, students are required to be able to understand concepts with explanations that are as they are so this triggers misconceptions in students. Meanwhile, (Alhinduan et al., 2016) found the highest misconception in the concept of "electric current in resistance" at 44.83%. In the study (Alhinduan et al., 2016) the cause of the misconception was not explained, this study only identified the occurrence of misconceptions regarding dynamic electricity material. The difference between the research of Minarni et al. (2018) and Alhinduan et al. (2016) lies in the depth and scope of diagnostics, where (Minarni et al., 2018) provide more in-depth details

regarding the high, medium, and low categories of misconceptions. Research using the three-tier test instrument was also conducted on the topic of GLB in the study (Artiawati et al., 2018; Maulini et al., 2017) which used spring force material. Artiawati et al. (2018) identified the largest misconception in the concept of acceleration at 68%. (Artiawati et al., 2018) did not explain the cause of misconceptions, while (Maulini et al., 2017) found that 40% of students had misconceptions about spring force. Misconceptions in (Maulini et al., 2016) can occur because students gain knowledge based on their daily lives, where this knowledge cannot be proven scientifically. In addition, if students are wrong in compiling their knowledge or it can be said that compiling knowledge based on real experiences that are closely related to daily life, then misinterpretation in understanding the relationship between concepts can occur. The significant difference in these two studies lies in the type of physics material tested, but the methods used remain similar. The significant difference in these two studies lies in the type of physical material tested, but the methods used remain similar. Other research related to misconceptions analyzes how the application of learning models can reduce the percentage of misconceptions. Before the blended learning model was implemented, the rate of misconceptions identified using the Four Tier Test diagnostic was 54.90%, and after the blended learning model was implemented, it became 22.04% (Kesuma et al., 2020). Apart from the blended learning model, misconceptions can also decrease using the Ethno-Stem-Project Based Learning model based on research results from (Martawijaya et al., 2023).

Identification of misconceptions can also be done using a diagnostic test using the Four Tier Test instrument in a study with fluid dynamics material on the principle of continuity by (Sholihat et al., 2017) there were 28% of students whose misconceptions were caused by the inaccuracy between logical thinking and students' understanding in analyzing fluid movement. The Four Tier Test instrument was also used in the study by Annisa et al. (2019) material on regular circular motion and research by (Erwinsyah et al., 2020) on straight motion material. Regarding the analysis that has been carried out in the research by (Annisa et al., 2019) it was obtained that overall students who experienced misconceptions were 30.69%. If the percentage of misconceptions is based on indicators, then in the first indicator related to the characteristics of circular motion, students' misconceptions were 35-38%, In the second indicator regarding the relationship between angular quantities and linear quantities there were three questions with the third question the percentage of misconceptions was 51.7%, the fourth question 24.1%, and the fifth question 10.3%. Misconceptions can occur because students are not careful in reading, interpreting, and recognizing the units in the questions given. On the other hand, the percentage of misconceptions found by (Erwinsyah et al., 2020) was 15.57%. The results of observations and interviews with educators obtained the fact that in measuring the level of understanding of the concept, educators used descriptive questions and practicums carried out in the laboratory or in the classroom. Students have varying levels of conceptual understanding because there are students who read and re-understand the material that has been presented by the educator in class.

Misconceptions can originate from textbooks used by educators and students. This is supported by research conducted by (Khoiri et al., 2017; Nurdiansyah et al., 2018) using the content analysis method to analyze and detect errors/misconceptions in textbooks. The difference in research focus is only in terms of the physics material used. The results

of the study (Khoiri et al., 2017) related to linear motion kinematics material and the results of Nurdiansyah's research. (2018) related to motion dynamics material show misconceptions in various aspects such as explanations of concepts, formulas, symbols, and images.

It is important to know the various causes of misconceptions and how to diagnose misconceptions so that they can be used as a basis for deciding on improvement strategies to overcome misconceptions (Resbiantoro et al., 2022). There are appropriate steps to determine student misconceptions, namely by using tiered diagnostic tests through the Three Tier-Test or Four-Tier Diagnostic Test methods which are effective in revealing misconceptions. The test consists of multiple choices to test conceptual knowledge, questions about the reasons for choosing the answer, and questions about students' confidence in their answers. In addition, the four-tier is to evaluate confidence in the reasons given. Next is qualitative analysis, namely after the test is conducted, the results need to be analyzed to identify areas where the most dominant misconceptions occur, such as mistaken perceptions about electric current or the motion of objects. After that, the source of misconceptions is examined, for example in teaching materials such as textbooks used. Content analysis helps find misconceptions that originate from incorrect explanations or inappropriate presentation of material. Misconceptions are overcome by taking an interactive approach to teaching and applying various learning models, such as group discussions, direct experiments, or visual simulations. A structured approach like this can help reduce misconceptions and improve students' understanding of physics concepts.

CONCLUSION

The learning methods and models influence students' understanding of the concepts applied. Innovative learning models such as Learning Cycle (LC) 7E, generative learning, and guided inquiry effectively increase students' conceptual understanding of various physics topics. Developing learning modules based on Science, Environment, Technology, and Society (SETS) and E-LKPD technology based on the Physics Toolbox Sensor Suite have significantly impacted students' understanding of physics concepts. However, misconceptions are still a significant challenge in learning physics. Misconceptions related to basic physics concepts, such as dynamic electricity, rectilinear motion, and spring force, are often found among students. Tiered diagnostic methods, such as the Three-Tier Test and Four-Tier Diagnostic Test, are very effective in identifying areas of misconception that need to be corrected. Combining innovative learning models and using modules such as those based on SETS and E-LKPD technology based on the Physics Toolbox Sensor Suite can be an option for teachers to increase students' understanding of concepts, thereby reducing the risk of misconceptions among students. Future research could investigate cross-cultural diagnostic misconceptions, integrate AI tools in tiered diagnostic methods, and explore other innovative learning models.

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