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Analysis of Students' Understanding of Concepts in Straight Motion Material in Physics Learning

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Abstract: The research was conducted in order to be able to analyze understanding of concepts in straight motion material. The research that was carried out used a quantitative research type with a descriptive approach to the population of 20 students in physics learning on straight motion material. random sampling technique methods and using instruments in the form of essay questions on straight motion material given to students using a ratio scale with an absolute zero value. Data retrieval analysis technique in which each student is able to solve questions which can be analyzed using 3 indicators, namely: (1) students can restate a concept, (2) utilize arithmetic operations, (3) classify and Students are able to give an example or not an example. The technique used when collecting data is in the form of tests and documentation. The results of this study show that the level of students' understanding of concepts in physics learning is in the category of understanding concepts 25%, not understanding concepts 30%, misconceptions 25%, guessing, 20%

INTRODUCTION

Education is carried out by every human being with awareness and purpose to achieve the goals and ideals that are dreamed of, learning has an evaluation system that is shown for children so that they can be more active and have the ability to face education in the era of globalization in order to develop children's knowledge, improve intelligence, personal values, morals and skills (Capriconia & Mufit, 2022), besides that education learns about knowledge, skills and habits that are carried out individually or in groups of people from year to year learning is carried out by means of training and research where education has an important role for human resources so that learning can be better it is hoped that it can develop attitudes, skills and intellectual intelligence of students but there are many various obstacles or problems that can be considered in an element of an educator and students as for what can be addressed effective in adding quality to education, namely by making improvements and progress, one of which is by studying physics learning (Fauziah & Darvina, 2019).

Natural phenomena that can be found in everyday life, namely that they can provide knowledge about natural phenomena or phenomena, through several scientific methods or methods or in a systematic way (Nikat et al., 2021), physics uses a process

that can start from observation, measurements and analysis where to find out it requires a long period of time but you can be sure the results are real where physics can be proven to be true.

Physics learning learns a lot about nature, such as studying material, temperature and natural events that are around. Natural events that occur are big or small, examples of big events are like the earth moving around the sun, while small natural events are like an electron moving around. encircling the nucleus associated with a change of a substance or an energy. However, students have not been able to study learning properly because many students do not understand how to learn efficiently or effectively because most students memorize learning while learning physics is not material to be memorized but students are able to provide a tuning or an understanding of a the concept of learning physics (Fransiska, 2018).

Understanding a concept is the ability of a person in learning in a cognitive form (Hasbullah et al., 2019) many students do not know, recognize but are able to repeat a concept that is easier to understand or re-apply it if a student is unable to explain the concept that has been studied and cannot apply the learning concept, a student is declared not to understand the concept of learning as in physics learning if a student can re-explain the material that has been studied and can apply it then a student is stated to be able to understand the concept that has been given by the teacher. As for students who do not understand the concept of learning physics, these students will find learning physics difficult (Astuti & Bhakti, 2021).

In the life that is being lived now, there are still many students who think that if an object is experiencing motion with time, the acceleration and the distance traveled will be the same, but basically the initial speed needs to be taken into account because these elements make the distance different, the factors that cause participants to students misinterpret because of a lack of understanding of the concept and a lack of interest or enthusiasm of students in learning physics so that it can affect learning outcomes (Nukhba et al., 2017), in this study a student Before entering physics learning students must have their own concept of the material being studied. will be studied but many of them find motion events such as an object moving straight or falling freely from these events they have a conception so that students can have physics concepts built by the students themselves through informal learning (Ma'rifa et al., 2018).

This research is to uncover a misconception about the concept of straight motion, so a research is carried out which has the goal of being able to know about the results of guessing students' understanding, students understand the concept, students do not know the concept or understand the concept of learning that has been obtained about helping to be more it is easy to see how well students understand the concepts being studied so that the concepts are expressed alternatively in physics learning that students have (Madina et al., 2022), there have been several ways that have been used to identify a misconception in students, namely among them consists of introducing concepts, giving multiple questions or essays in writing, direct interviews, discussions when conducting learning on students. As for the methods that can be used to identify students using a certainty response index method or what is usually called (IRK) where sebu The method

which is another name for the certainty response index or (CRI) IRK method is not only biased to identify a misconception but is also able to distinguish students who understand the concept (Setyantini et al., 2022)

Table 1. IRK Scale and its Criteria

IRK	Criteria
0.	Totally guess answer
1.	Almost guess
2.	not sure
3.	sure
4.	almost certain
5.	certain

It can be stated that the number 0 is for students who do not know at all about the methods or laws that have been used in answering a problem while the number 5 can be stated as high student confidence in the knowledge they have without any element of guessing and if the confidence scale is low (IRK 0-2) then it can be interpreted to mean this can reflect that the process of guessing an answer is very large in determining an answer that has been chosen and without thinking about whether an answer that has been chosen is correct or not while IRK with a high scale (IRK 3-5) can prove that students can have a high level of confidence in answering questions where it has been stated that IRK is a measure of students' confidence in answering every question given to students specifically in a question. tests and questions in the form of essays where students can wab an answer that is considered correct from the choices provided or that have been studied, can provide an IRK scale from 0-5 for all selected answers. IRK 0 is given if the answer chosen is the result of guessing while IRK 5 is given if the answer which is chosen on the basis of the ability that students believe or really understand in answering a question that has been given.

Constructive physics learning which is expected to make students more active and become the center of a learning and learning activity and can be assisted by a teacher so that students in a constructivist learning can try to acquire new knowledge where existing knowledge is through an active mentality. students actively build knowledge for the students themselves, an initial knowledge is known, compiled, redeveloped, and changed by students through interactions between the environment, class activities, and an experience and learning is expected to achieve the objectives of learning physics where the learning objectives physics that originates from the nature of science which has implications for an implementation of physics learning where the implementation of physics learning that is able to accommodate a physics learning goal can show that a physics learning goal is to help students build physics knowledge science, the ability to solve problems and introduce scientific culture.

METHOD

Where is this research that aims to be able to see student understanding (Wicaksono et al., 2022), where this research uses a quantitative type and descriptive approach, where it is explained that descriptive quantitative is a research method in order to get a systematic picture of documents if it is done using a quantitative type, the population taken is class X students, totaling 20 people and using the free variable understanding the concept of straight motion using tests and documentation, samples at SMA n 7 Kota Jambi, data collection is a very necessary step when going to do a research because of that it is necessary to collect data in this research when collecting data by means of tests and documentation.

Where the instrument used is in the form of questions on understanding the concept of straight motion material which is given to students and uses a ratio scale where there is an absolute zero value, for sampling it is carried out using the radom sempling technique. In the analysis of data collection carried out by students completing the questions and then they will be analyzed according to 3 indicators, namely repeating the concept, utilizing arithmetic operations, clarifying and giving examples or not examples of tests used here in the form of written tests regarding the concept of straight motion tests a misconception diagnostic where the test is in the form of an essay question accompanied by an appropriate reason (IRK). analysis for processing a data is a step that is really needed when going to do research on the results of answers obtained from a respondent and need to use the formula,namely :

$$P = \frac{f}{N} \times 100\ \%$$

Information :

f : Frequency of students' answers on each question

N: Number of students

P: The percentage of students' answers to each question is 100% = called a constant number

When data processing is done by grouping using a diagnostic test where the IRK has been completed then it is presented by grouping students, namely:

Table 2. IRK scale

No	Scale IRK	Student value group
1.	Low <2,5	Guess
2.	High >2,5	misconception
3.	High >2,5	Understand concept
4.	Low <2,5	Don't Understand concept

Modified (Nasir, 2020)

After grouping the data using the IRK scale, it will be easier to find out students who guess, have misconceptions, understand concepts, and do not understand concepts, therefore in the calculations to find out students' understanding of concepts will be easier because they are already on the IRK scale. already exists, after we give questions to students we can give points to questions so that after getting points we can immediately

calculate using the formula that has been set so that we can easily calculate the points that have been obtained by students who will later get a scale IRK so that it will be known how much students understand the understanding of the concept.

There are facts in the field that have shown that the level of mastery of physics concepts at SMA Negeri 7 Jambi City is still very low, which can be seen from the results of solving problems on the material of uniform straight motion and uniformly changing straight motion which has not yet reached the very understanding criteria. ased on the description in the background contained above, it is necessary to conduct a study to be able to find out what causes the low understanding of students' concepts in the material of uniform rectilinear motion and uniformly changing rectilinear motion when solve problems so that they can be used as a reference for improving and improving student physics learning outcomes, especially in the material of uniform rectilinear motion and uniformly changing rectilinear motion, therefore a research can be carried out which aims to be able to analyze an understanding of students' concepts that can be connected with other conditions that were also found in the population in which this study contained students at SMA Negeri 7 Jambi City in the 20021/2022 academic year who had been taught the material of uniform rectilinear motion and uniformly changing rectilinear motion where samples were taken from one class so that it was easier when collecting data because by using one class or one sample we don't need another class because in sampling we focus on one class regarding understanding physics concepts in matter of uniform straight motion and uniformly changing rectilinear motion which will focus more on the material will be given so that we can distinguish students who really understand a concept in physics learning that has been taught so that they have no difficulty if there are questions regarding the material of uniform rectilinear motion and uniformly changing rectilinear motion in the delivery of material that will be conveyed to the teacher students must also be able to see the circumstances, the situation so that they can convey material that is really easy for students to understand.

RESULT AND DISCUSSION

The results of student research that has been carried out using the essay question test on conceptual understanding material can be seen in Figure 1.

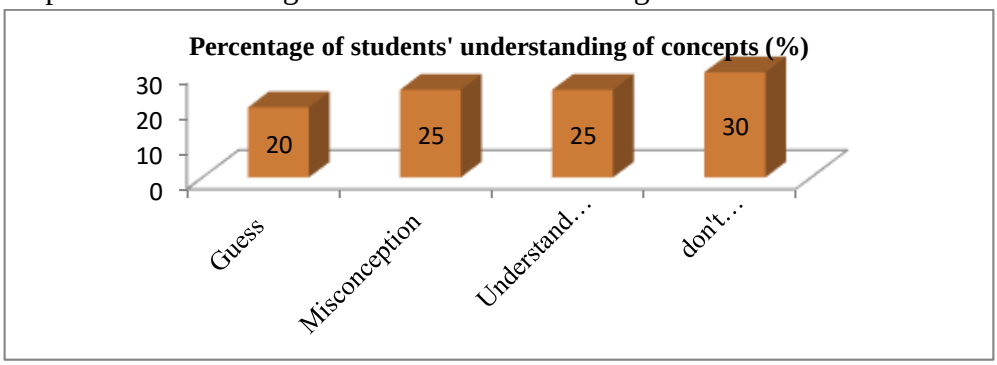

Figure 1. percentage of students' concept understanding

Analysis of understanding the concept carried out at SMA Negeri 7 Jambi City in class X IPA students in phase e6 where each student has completed questions on straight

motion material where the results of the percentage of students on understanding the concept of straight motion in guessing understand the concept is 20% with the less category where the lack of understanding of the concept is caused by the daily experiences of students because they think that when a train is running on a straight rail the train will never stop, the percentage of students who do not understand the concept of straight motion material is at most on indicator 3 (question 3) clarifying and giving examples or not examples, misconceptions about understanding the concept of straight motion material by 25% with a pretty good category where students' misconceptions are caused by students' wrong concepts where students think that if there is an object that fall simultaneously then the distance traveled will be the same the percentage of misconceptions about straight motion material is at most in indicator 1 (questions 1 and 3) restating the concept, understanding the concept in straight motion material is 25% in a bad category, understanding concepts in the category is not good because most students are not good at understanding physics concepts in straight motion material where students when understanding the concept of students when solving questions in the form of calculations students answer using formulas and the correct way the percentage of understanding physics concepts, the percentage of understanding physics concepts the highest score is in indicator 2 question number (2,3 ,4,5) the second indicator is utilizing arithmetic operations, not understanding the concept of straight motion, while for those who do not understand the concept of straight motion material physics learning is 30% in a bad category because some students are not good at not understanding concepts in straight motion material at most in indicator 2 (questions 1 and 3) the first indicator is menya Reassess the concept where students really don't know about the concept of straight motion material physics learning, the concept tested in this study is about calculating constant velocity, analyzing acceleration values (Sujadi & Kholidah, 2018).

The discussion of each question in which the answers include the IRK provisions contained in the compilation of the results from the analysis of the answers from the students is divided into 4 of them using Lucky Guess (LG), that is, if the student answers the question correctly and the IRK is low (<2,5), Do not know the concept (TTK), that is, if students answer the questions wrong and the IRK is low (<2.5), Knows the concept (TK) while students answer the questions correctly and the IRK is high (> 2.5) while those who are The meaning of the misconception is that students answer the questions wrong but their IRK is high (> 2.5). In general, at each point of the questions given by the educator, it turns out that there are still many students who do not understand the concept of clarifying and giving examples or not examples, so the students' lack of understanding of the concept can be seen from the number of student answers that are wrong, it turns out that there are still many students. when answering the wrong questions in entering the formula and wrong in applying the concept.

Restate The Concept

When restating the concept of rectilinear motion, students can restate the concept of rectilinear motion around the material of rectilinear motion that has been studied, such as the meaning of rectilinear motion and the relationship between rectilinear motion in

solving questions of understanding the concept of rectilinear motion material. It is very important for students to have students who aim to support students' understanding of physics learning while the results of this study show that the average percentage of students understands concepts in indicators that restate concepts, namely getting a percentage of 25%, so of all indicators of understanding concepts in this material, this percentage is into a fairly good category the percentage is in indicator number question 2 with a large percentage of 50% in the high category and for the lowest percentage is in the indicator question number 4 with a percentage of 30% in the low category for understanding concepts on indicators that restate the menu concept Show results where this indicator states unsatisfactory results in restating concepts in physics learning on straight motion material, understanding which states repeating the concepts in the material where students need to understand and reason about each point of the questions to be answered The understanding of the concept that students need to have when repeating the concept of rectilinear motion in working on questions is as follows: being able to explain the meaning of the concept of rectilinear motion, being able to distinguish the characteristics of straight motion material, being able to distinguish types of rectilinear motion.

Classify and provide examples or non-examples

Understanding the concept in classifying and giving examples or not examples of the concept of straight motion so students students explain the characteristics and understanding of the concept of straight motion in solving problems in this case understanding the concept needs to be owned by students so that they can support a broader understanding of student concepts as for The results of this study indicate that the percentage of students has an average understanding of the concept on the indicator of clarifying and providing examples or not examples of understanding the concept, namely getting a percentage of 20% of all indicators of understanding the concepts in the straight motion material. This percentage is included in the low category. with the percentage of indicator number question 1 with a large percentage of 85% the high category and the lowest percentage is found in the indicator/question number 3 with a percentage of 35% the low category for understanding the concept of classifying indicators and giving examples or not examples understanding of the concept shows satisfactory results so for understanding the concept of the second indicator there is no problem which is when solving comprehension questions which state repeating concepts in straight motion material where students need to understand and reason each point of the questions to be answered understanding the concepts that need students have when repeating the concept of rectilinear motion in working on the problem, which is as follows: can explain the meaning of the concept of rectilinear motion, can distinguish the characteristics of rectilinear motion, can provide examples or non-examples according to the type of understanding of the concept of rectilinear motion.

Utilize Computing Operations

In the use of arithmetic operations in physics learning on straight motion

material, it means that students must be able to use arithmetical operations in solving the problems that have been given by educators. Therefore, this understanding needs to be owned by students in order to support understanding of physics learning material in straight motion for students. As for the results of this study, it shows that the average percentage in understanding physics concepts in straight motion material in the third indicator is the use of arithmetic operations in learning physics in straight motion material for understanding concepts, namely getting a percentage of 30% of all indicators of understanding concepts in straight motion material, this percentage it is included in the good category with the percentage of indicator number 5 with a large percentage of 50% in the high category and the lowest percentage is in the indicator/question number 4 with a percentage of 30% in the low category understands straight motion material on indicators that classify and provide examples or not examples of understanding the concept shows satisfactory results so for understanding the concept of the second indicator there are no problems when solving questions (Sujadi & Kholidah, 2018),The understanding that states repeating the concept of straight motion material where students need to understand and reason about each point of the questions to be answered is the understanding of the concept that students need to have when reiterating the concept of straight motion in working on questions, namely as follows: Can use arithmetic operations according to with the concept of understanding straight motion, can use arithmetic operations according to the problems faced by students who lack understanding.

In learning physics material in a straight line for students' understanding of the concept, it can be seen that the student does not exactly give reasons for the test questions about the concept of physics in straight motion material. The understanding of the concept in a study is in the form of the cognitive domain of Bloom's taxonomy, where in this study understanding is a type of learning that is higher than Bloom's own knowledge (1956: 89-90) has described that understanding is divided into three aspects including: : translation, interpretation, and extrapolation Regarding a discussion of students' understanding of concepts in physics learning material straight motion on cognitive aspects. understanding this concept can also be done through extrapolation or in other words expanding data beyond what is available as well as more in-depth knowledge and also providing concepts that are in accordance with the abilities of students, while this activity is carried out so that students no longer memorize learning concepts by notes that these students have been able to understand the concept of learning physics.

Overall the results of this research can show that when sorted from the three indicators of understanding from the highest level of understanding of concepts to the lowest level of understanding of concepts, namely: classifying and providing examples or non-examples, utilizing arithmetical operations and restating concepts (Sujadi & Kholidah, 2018), So in each indicator there is a difference in the level of understanding of classifying and giving examples or not examples that are higher compared to using arithmetical operations and restating concepts. This is due to the lack of students understanding the concept, and these students are still confused and have difficulty

associating the relationship between concepts, difficulty understanding and understanding the material and also interpreting the formulas in the straight motion material.

As for the lack of student interest in Physics learning can also affect students' understanding of concepts, so if these students are not interested in studying the straight motion material, students will tend to be indifferent and indifferent to physics learning and can affect students' understanding of concepts which will greatly decrease or do not understand the concept of the material at all. straight line, To anticipate this happening, there are several roles of the teacher including the teacher has a very important role to be able to increase the feeling of liking and curiosity about learning which according to students is very boring right, and the teacher's way of teaching is very influential to increase students' curiosity, and educators also provide learning motivation so that it can be interesting and can stimulate high-level students' thinking. Therefore, teachers must also build thinking so that these students can think critically and can understand physics concepts better (Sukadi & Khaerul, 2020).

Understanding the concept is a process for someone to think in order to be able to understand and understand a concept in learning and also to process a learning material that will be received so that it becomes more meaningful here there are several factors that greatly influence a learning process which can cause obstacles to achieving understanding The concept of these factors include internal factors including the teacher, students' attitudes towards learning outcomes, student motivation to study, concentration in learning, as for managing the materials used for learning, as well as exploring learning outcomes, great self-confidence and student habits in subsequent learning, namely external factors, namely consisting of schools, teachers, and friends and the learning model used by the teacher. so in this external factor besides teacher friends also occupy a position that is no less important which can affect student learning (Dani et al., 2019), as for the way that can be done to measure students' understanding of existing concepts, namely the Ceyanty of Respondense Index method (CRI) the understanding of a concept is divided into three parts, namely: understanding the concept, misconceptions, and not knowing the concept by measuring the understanding of the concept using the CRI method where this method is used to see the level of the student's answer and also confirm the student's answer in answering questions using the CRI scale, because with the CRI scale it can make it easier for educators to know the certainty of the student's answer, therefore the CRI scale is good to use to see students' answers when answering questions that have been given.

In physics, concepts are very important, one of which is the concept of time in free fall motion which basically does not depend on the characteristics of objects, such as mass, density/shape which was emphasized by Galileo who stated that all objects that experience free fall, both weight and Light will fall with the same acceleration if the air effect is ignored and if the falling distance is shorter compared to the radius of the earth where according to Galileo air resistance will act as a drag on very light objects which have a wide surface. However, air resistance can be ignored if an object is in a space that is dropped simultaneously, then an air resistance can be ignored in the movement of the

two balls during free fall so that the two balls will reach the ground at almost the same time because the two The balls that have the same acceleration are the accelerators the force of gravity and travels the same height when viewed from the surface of the earth the speed of a bowling ball horizontally and will be the same as an airplane speed so when viewed by standing still above the surface of the earth you will be able to see a blowing ball will fall by forming a trajectory parabola, the blowing ball does not have a horizontal acceleration so that a blowing ball speed horizontally will remain constant and will be the same as the plane's speed where an airplane will always move to the right with the same horizontal speed while the speed of a blowing ball will change vertically uniformly due to a vertical acceleration of the blowing ball which will be constant (gravitational acceleration).

In learning a physics it is very important to understand the concept of learning because it can be assisted in strategies related to understanding concepts and models in learning where there are several models that can be used to be able to learn understanding of concepts while being able to learn their application to solving problems, models which can be used are interactive engagement, modeling instruction, problem base learning where strategies that can and can be used in a problem solving are conceptual problem solving where interactive engagement (IE) learning activities focus on increasing a conceptual understanding and can solve a problem through active participation and often being stimulated with a technique such as a cooperative group in solving a problem, the results can be predicted regarding understanding the concept on the material of uniformly rectilinear motion and uniformly changing rectilinear motion.

A physics learning enriched with IE turns out to be unable to produce a strong increase when compared to traditional learning in the aspects of solving a quantitative problem where in other words if it can be seen from an aspect the results of solving a quantitative problem traditional learning is more active and more right compared to IE (interactive engagement) while modeling instruction is teaching with a physics model approach, namely a physics model which can be in the form of graphs, diagrams, and mathematical equations where physics models can be used or taught to help students during activities in learning because physics models have a function in relation to understanding phenomena and models can be used to describe, explain and predict new phenomena while the core of student learning activities in modeling instruction is a construction and application of physics models d i where learning physics models can help or can process solving physics problems.

Modeling instruction also has two phases of implementation, namely the development model and the deployment model where students can collect data so they can create a model that can be related to physical phenomena where practicum can be done in a phase of the deployment model model while the problem based learning model is able to focus participants educate students on problems, organize students to be ready to learn, help students carry out independent and group investigations, create or display work, analyze and be able to evaluate the process of solving a problem faced by a problem contained in physics not only includes 1 concept but can include more than 1 concept of the problem to be faced.

Based on the results of observations of students, it was found that there are factors that can cause misconceptions, namely:

The cause of misconception comes from the teacher

Where the results of the observations that have been made by students in class X IPA phase e6 SMAN 7 Jambi City can be seen from the students when working on the questions that have been given they do not understand the material that has been taught because of the lack of communication between the teacher and students so that the students students find it difficult to ask the teacher if there is material that they want to ask or do not understand, this could be a supporter regarding the causes of a misconception for students in class X IPA phase e6 SMAN 7 Jambi City where students can continue to experience misconceptions because of the lack of communication or teacher monitoring to correct misconceptions that have been experienced by students.

The cause of misconceptions comes from students

Students can be one of the factors causing a misconception in class X IPA phase e6 of SMAN 7 Jambi City where this occurs because there is a preconception that from the start students have had on physics material before they did not understand the concept of uniform straight motion material and straight motion changes irregularly, especially in a lesson where physics material is taught by doing practicum, if an error occurs in the initial material, it can affect the following material, thoughts from the beginning are negative in physics learning, where many think that learning physics is complicated, so there is a lack of interest. students towards learning physics so that this results in a lack or absence of initiative for students to learn to better understand each concept in depth.

Misconception factor because there is wrong intuition in students where students only memorize theory without understanding concepts so that when given questions with the same concept but different forms students have difficulty answering them, where this assumption is in line with research conducted to analyze class X misconceptions IPA phase e6 SMAN 7 Jambi City in learning uniform rectilinear motion and uniformly changing rectilinear motion with CRI it can be explained that the causes of misconceptions consist of various things including student conceptions, incomplete reasoning, wrong intuition, student cognitive development, student interests, and student abilities.

CONCLUSION

From the discussion above, it can be seen that this study aims to find out students' understanding of concepts in physics learning material in straight motion where based on the results of the research that has been done, students of SMA Negeri 7 Jambi City experience not understanding the concept in learning physics in straight motion material the percentage obtained for guessing is 20%, misconceptions are 25%, understanding concepts are 25%, not understanding concepts are 30%, therefore it can be concluded that students' ability to understand concepts is relatively low or they have difficulties in learning so that they do not understand concepts. As for suggestions for future researchers, namely the subject or the environment where the research is held,

SMA Negeri 7 Jambi City must expand more both in terms of material, subject matter or the environment where the research is carried out and must improve the methodology for further researchers. Instruments are needed that are truly able to make students more productive. focus on doing the questions.

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