

Identification Of Misconceptions Of Eighth Grade Students On Light Materials And Optical Devices

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ABSTRACT

This study is a descriptive study that aims to analyze the understanding of the concept of students in science subjects on the material of light and optical devices as well as the causes of student misconceptions. This study was conducted on VIII grade students in SMP Negeri 5 Palembang. The subjects of this study were 100 eighth grade students in SMP Negeri 5 Palembang. The instrument used is a set of diagnostic tests consisting of 10 items of questions from physpot which has been translated and tested for validity. Data retrieval method is done by providing a test of understanding the concept of multiple choice questions as many as 10 items equipped with CRI (Certainty if Response Index) with a scale (0-5). In this study it was found that the average score obtained by students from the test is quite low at 50%. In addition, 9.28% had misconceptions, 38.5% did not understand the concept, and 28.5% had understood the concept. Some of the findings identified misconceptions include: (1) only white objects that can reflect light in a dark room, (2) points near the eyes of patients with hypermetropia, (3). light propagates about transparent objects and (4). light reflected from smooth surfaces.

Keyword: CRI (Certainty if Response Index); misconceptions of light and optical devices

INTRODUCTION

In the learning process mastery of the concept is very important as a foundation, if the mastery of the concept of low students and build knowledge selanjutnya become fragile (Syuhendri, et al., 2014). In the teaching and learning process it is necessary for some key concepts to be well understood by students to develop a better conceptual understanding (Ferreire & Lemmer, 2017). Low understanding of concepts and various misconceptions in learning science is a classic problem that continues (Syuhendri, 2017). In the process of learning the concept that students have today is the concept they brought while still in elementary school. Therefore, the understanding of the concepts that students have is very diverse. Low understanding of concepts is one of the causes of misconceptions or errors in understanding concepts.

Misconceptions are one of the serious problems in education in Indonesia and this is a factor in the low quality of educational results (Syuhendri, 2019). Misconceptions not only affect change but can also be an obstacle in learning (Syuhendri, 2017).

Based on the results of research conducted by Syuhendri (2019) with title "The Development of Newtonian Mechanics Conceptual Change Text to Overcome Students' Misconceptions" menyatakan bahwa siswa-guru mengalaih miskonsepsi yang kuat tentang gravitasi. The highest level of misconception detected was students who argued that heavier objects always fall fast (79.45%). Another misconception Emapt of a higher level is : gravity increases when the object falls (47.95%), gravity acts after the power thrust weakening (21.92%), gravity relief air pressure (16.44%) and gravity intrinsic mass (4.79%). In this study, students not only have misconceptions about the increased gravitational force acting on an object on its journey to Earth at

dawn, but also have misconceptions about the availability of thrust. In addition, the teacher or educator must pay attention to conceptual understanding in the teaching and learning process in the classroom. In an effort to improve students' understanding of concepts in the classroom, it is necessary to overcome the problem of misconceptions because the traditional ways are reported to be ineffective in overcoming misconceptions.

Based on previous research, it is known that there are still students who have difficulties when learning and understanding science material. Concepts are important in the learning process, this is due to the learning activities associated with the knowledge of concepts. Concept is an abstraction of the characteristics of something that makes it easier for humans to communicate and think (Syuhendri, 2010). In the process of learning science, there are wrong concepts that have been patterned on each individual student. Neglect of the basic concepts of science can be a cause for misunderstanding of the concepts of science further. In science learning, the existing concepts in the form of abstract and complex concepts and traditional learning used have no impact on students' understanding of concepts (Syuhendri, 2017). Concepts understood by students experience discrepancies that can cause the desired science learning outcomes difficult to achieve (Pratiwi, 2015). Misconceptions in students will inhibit the acquisition of new knowledge and can cause students during the learning process to make conceptual mistakes (Eviyani, 2017). Various causes of problems caused by misconceptions, it is necessary to minimize the decline of student learning outcomes.

Through diagnostic tests is one way to identify misconceptions. Using a good diagnostic test will be given an overview of the misconceptions that occur in students, the level of understanding of students what students who

have understood the material, do not understand the material and show the mindset of students in solving the questions given even though the resulting answer is wrong. One way to form a diagnostic test that contains multiple choice questions with a choice of reasons is two-tier as well as the level of confidence when choosing answers and reasons so that misconceptions can be detected. However, in reality not all students' mistakes in answering questions can be classified into misconceptions (Syuhendri, 2010), this can happen when students answer incorrectly because they do not understand the concept or do not know the concept (Amin et al., 2016). One way in improving students' conceptual understanding or to overcome misconceptions is by filtering conceptual understanding from wrong concept into right concept (Syuhendri, 2017).

Based on the above description, the importance of understanding the concept of students on light materials and optical devices. Researchers want to conduct further research to describe the level of understanding of the concept of students on the light material and optical devices during the learning process with the aim to see a picture of the problems experienced by students in learning on science subjects.

RESEARCH METHODS

This study was conducted on VIII grade students in SMP Negeri 5 Palembang. The subjects of this study were 100 eighth grade students in SMP Negeri 5 Palembang. The instrument used is a set of diagnostic tests consisting of 30 items of questions from *physpot* which has been translated and tested for validity by expert lecturers. The method of data retrieval is done by providing a test of understanding the concept of light matter and optical devices in the form of multiple choice questions as many as 10 items equipped with CRI (*Certainty if Response Index*) with a scale (0-

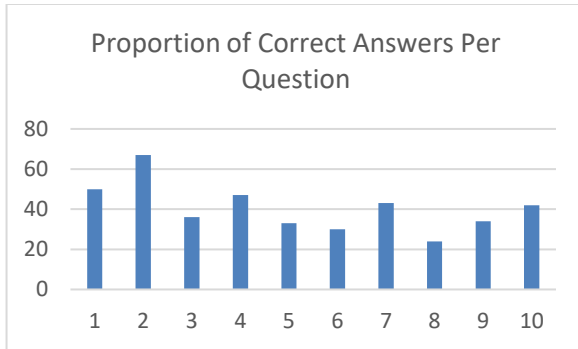
5). Based on the above description, the identification of student misconceptions and their causes, where the causes of misconceptions derived from the students as in Table 2 (Suparno, 2013: 34). In this study, the identification of the causes of students' misconceptions is limited to five causes of misconceptions, namely preconceptions, associative thinking, humanistic thinking, incomplete reasoning and wrong intuition. Diagnosis data is expressed in the form of a percentage of total student misconceptions to the overall number of students based on the Table 1. Percentage of Correct Questions

pattern of answers. The causes of misconceptions were identified from students' mistakes in choosing reasons at the second level (two-tier).

RESULTS AND DISCUSSION

Based on the results of diagnostic tests, the average percentage of students' level of understanding is obtained, shown in Table 1.

Problem Number	About	Correct percentage (%)
1	Why do eyes see things?	50
2	Why can't we see anything in the darkness of the night?	67
3	Why does an object seem small and dark when it moves away from us?	36
4	One example of shadow formation is when an eclipse occurs due to obstruction of light from the observation area. What orientation will the lunar eclipse produce?	47
5	Sunlight can be used to tell the time. How will your picture appear at 12: 00 while standing outside the classroom on a hot day?	33
6	Why can't we look directly at the sun?	30
7	Why do some objects, such as wooden blocks or paper, not reflect your reflection ?	43
8	In the atmosphere, moisture acts as a prism to separate white sunlight into different colors. When you look at the sunlight during the day, you find the sky is blue. However, the sky at sunrise and sunset is red. What causes these colors?	24
9	What will happen if light hits the surface of a transparent medium and some of the light goes into a new medium?	34
10	The figure below illustrates the wave nature of light and the phenomenon of refraction	42



Based on Figure 1, it can be obtained that the average student can answer the question for 10 items correctly by 65% on Item Number 2, 50% on item Number 1 and 45% on item number 4.

Figure 1. Average percentage of students ' level of concept understanding

Table 2. Misconceptions on the material concept of light and optical devices

No	Misconceptions	True Theory	Description
1	Only white objects can reflect light in a dark room	Any object that is not dark in color can be a source of light. For example, if you see a blue object, it means that the object reflects blue light.	objects are grouped into light source objects and dark objects.
2	The point near the eyes of patients with hypermetropia is farther than the point near the normal eye.	Farsightedness-Hypermetropia. People who suffer from farsightedness or hypermetropia are not able to see clearly objects that are located at a nearby Point, but still able to see clearly objects that are far away (infinite). The point near the eyes of people suffering from farsightedness is farther than the normal reading distance ($PP > 25 \text{ cm}$).	The point near the eye (Punctum Proximum = PP) is the closest point that can still be seen clearly by the maximum accommodative eye.
3	About sound travel. Students assume that sound propagates most rapidly through a vacuum or a space in which there is no air..	Whereas in a vacuum the sound cannot be bridged	Sound cannot propagate in a vacuum. For example, an electric bell placed in a vacuum container. If it is hidden, we can hear the bell ringing. However, if the air is in a container from which the air is expelled, the sound of

4	The law of reflection of light (angle of incidence = angle of reflection) occurs only in flat mirrors.	Though it also applies to curved mirrors	the bell is not heard even if the bell is vibrated continuously In addition to flat mirrors, reflection events can occur in concave mirrors and the law of reflection also applies. In the reflection of light by a concave mirror, the distance between the object and the mirror affects the resulting image.
5	Light is reflected only from smooth (flat) surfaces, not reflected from rough surfaces	Whereas on rough surfaces the light is also reflected.	A beam of light falling on an object with a rough surface will be reflected in the direction of an irregular reflected beam
6	Light propagating on a transparent object will be passed on without changing direction.	Even though through transparent objects it still changes direction, there is refraction by these objects.	If the direction of propagation of light is perpendicular to the boundary plane of the material, then the light continues to move straight despite the change in speed
7	On the occurrence of refraction in the lens. According to the students, the Rays incident on a convex or concave lens, are not refracted on the surface of the lens but on the center of the lens. In other words, the surface of the lens and the thickness of the lens have no effect on the process of refraction of light	even though something like this is wrong. Since the light is deflected and refracted precisely on the surface of the lens,.	because there is a difference in the refractive index of the two mediums, namely air and glass or glass and air

Source: Munawaroh Riyadlotul, dan Woro Setyarsih. 2016. Identifikasi Miskonsepsi Siswa dan Penyebabnya pada Materi Alat Optik Menggunakan Three-tier Multiple Choice Diagnostic Test. Vol. 05 to No. 02.

CONCLUSION

Level of understanding of the concept of Class VIII students in SMP Negeri 5 Palembang on the material of light and optical instruments with an average percentage of 50%, experience misconceptions 9.28%, do not understand the concept of 38.5% , and have understood the concept of 28.5 %. Misconceptions experienced by students can be caused by several factors. Some of the findings identified misconceptions include: (1) only white objects that can reflect light in a dark room, (2) points near the eyes of patients with hypermetropy, (3). light propagates about transparent objects and (4). light reflected from smooth surfaces.

This study can be used as a reference for further research for diagnostic tests of other materials. And can be used as a reference for teachers in learning to give emphasis to concepts in light materials and optical devices so that students do not experience misconceptions.

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