

Original Research Article

Diagnostic Test Misconception of the Sun in Elementary School

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Abstract: This study aims to determine the misconceptions about the motion of the sun experienced by elementary school students in Surakarta by using a three-tier diagnostic test. The descriptive method was applied with a sample size of 21 students from Surakarta elementary school. A three-tier multiple-choice diagnostic test instrument containing 5 items were utilized. The results revealed that the instruments were very well regulated. It was also found that students from Surakarta elementary school has a misconceptions about the motion of the sun. students experienced the following misconceptions: (1) students believe that the sun sets in the sea, (2) the sun is orange, (3) the sun disappears at night, (4) the sun is not a star, (5) a solar eclipse is a phenomenon where the shadow of the moon obscures the sun, with the finding of five response patterns that indicate misconceptions, from the test results of 21 students more than 16 that students experiencing these misconceptions.

Keywords: Misconception, Three-Tier Diagnostic Test, the Sun, Elementary School.

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INTRODUCTION

One of the goals of our educational program is for all students to become lifelong learners. To achieve this, teachers and students need to work together. It is the responsibility of the student to build knowledge, and the teacher is responsible for arming the students with the appropriate skills and environment to become lifelong learners.

By helping a student build their knowledge, an educator needs to understand how a student learns, the misconceptions they bring to the classroom, and constructivist epistemology in correcting misconceptions and building their knowledge. In this literature review, specific topics for student learning, misconceptions about the movement of the sun.

To increase the results of higher learning, the teacher must pay attention and investigate any deficiencies or weaknesses in the teaching and learning process, both in part due to students and teachers, using measurement and evaluation methods using quality and standardized tools to learn about aspects of student shortages. Instructors must measure and evaluate all

stages with measurement tests to obtain information that shows the strengths and weaknesses of students in each subject, each material can be double the usual exam, and the tests that can provide this information are well-called diagnostic test.

Diagnostic test is tool used to find deficiencies in academia in different disciplines and the strengths or talents of each student. The results of the diagnosis can be correlated with correcting or improving students' learning and finding ways to improve teachers' teaching methods to make them more effective. This is because the diagnostic test is a test used to measure the results of students' disabilities who do not know exactly where they do not understand. Get the results you want by helping teachers make the right teaching improvements (Pattiyatani, 2008).

Diagnostic test have several advantages, namely, they show weaknesses or deficiencies in student learning, know students' strengths or talents, identify teacher deficiencies, and can use diagnostic results to improve teaching and learning, encouraging students to improve their quality of study and helping teachers

think of new teaching methods. In learning, tests are needed that can diagnose students' success after the learning process. The word diagnostic test is widely used in medicine, psychology and education. (Rupp, *et al.*, 2010) said diagnosis means figuring out exactly how to know, decide and focus accurately. (Zhongbao Zhao, 2013) said that the main idea of the diagnostic test is to find out the strengths and weaknesses of students and to contribute to teachers and students to make decisions related to improving the teaching and learning process. One form of test used to identify misconceptions experienced by students is the three-tier diagnostic misconception test (Zulfikar *et al.*, 2017). Three-tier misconception diagnostic test is a test that consists of three levels (three-tier). Level-1 is a multiple-choice item and the answer is in the form of multiple choices. Level-2 is the expression of students' reasons for choosing answers at Level-1. Level-3 is the level of student confidence in choosing answers at level-1 and level-2.

The misconception is a conception that is incompatible with the scientific understanding or understanding accepted by the expert in that field (Suparno, 2013). This matter or issue will happen due to many factors. This factor can arise from students', teachers, textbooks, learning contexts and the teaching method (Suparno, 2013). Misconceptions the student can identify through a test called a diagnostic test. Conformable (Abbas, 2016) Abbas said the test is used to assess students' understanding of key concepts on certain topics.

Scientific topics with the material of the Solar System, the Movement of the sun are lessons for elementary school students', which are obtained through news and facts from the past to the present. Scientists study science that is used for different purposes. Knowledge of science is expanded, creating concepts that students have much to learn. Many concepts are associated with phenomena that cannot be seen with the naked eye at great distances, they cannot be reached. It is difficult for teachers in learning management so that students have the right understanding or concept. From questions to science teachers, it was found that some students misunderstood the movements of the sun. Many students understand that the sun sets in the sea, during the day without stars (Rukaiyah, 2021).

Research by (Arslan, *et al.* 2012) in the journal entitled "A Three-Tier Diagnostic Test to Assess Pre-Service Teachers' Misconceptions about Global Warming, Greenhouse Effect, Ozone Layer Depletion, and Acid Rain" Research which aims to 1) developed and verified the quality of three-tier diagnostic test on global warming, the greenhouse effect of ozone layer destruction, and acid rain, 2) studied misconceptions about global warming the greenhouse effect, namely the

destruction of the ozone layer and acid rain. A sample cohort of 256 students at a Southwestern American University. The research method used a three-tier diagnostic test. The results of the study showed that students experienced the most misconception as follows: 1) global warming caused by the destruction of the ozone layer, 2) global warming causes skin cancer, 3) acid rain is a result of global warming, 4) global warming can reduce waste emissions into rivers, 5) the greenhouse effect is a dangerous phenomenon for humans, 6) taking public transportation can reduce the damage to the ozone layer.

Research by (Dek Ngurah Laba Laksana, 2016) in the journal entitled "Misconceptions science material in elementary school". Research which aims to describe the misconceptions that occur in prospective teachers in science material in elementary schools. The research method used qualitative methods. The research subjects were 64 people, consisting of 44 female teacher candidates and 20 male teachers. The results of the study are as follows: (1) there are misconceptions in various science concepts in elementary school, (2) dominant concepts experience misconceptions with a percentage of more than 60% are (a) the concept of substances needed in the photosynthetic process of green plants, b) the concept of photosynthesis requires light, 3) the concept of density of the substance, and 4) the concept of free-fall motion. This research can use as a reference in this study as internal comparison data of diagnostic test misconceptions of the sun in elementary school.

METHODS

The method used in this research is qualitative with descriptive data, namely by making a real description because the qualitative methodology is a research procedure that produces descriptive data in the form of written and result diagnostic test from student in elementary school. This study aims to determine the misconceptions about the movement of the sun experienced by elementary school students in Surakarta by using a three-tier diagnostic test. The descriptive method was applied with a sample size of 21 students from Surakarta elementary school. A three-tier multiple-choice diagnostic test instrument containing five items were utilized.

The research data and data sources used a three-tier diagnostic test for elementary school students, writing articles to test students so that they could find the misconceptions experienced by students. The technique of data collection is done by analyzing documents, documents related to misconceptions that appear, through activities, tools for diagnosing misconceptions test. The test to diagnose misconceptions about the movement of the sun in elementary schools was conducted on research topics, namely elementary school students. The test performed

is one of the product testing activities. The test was performed on 21 students in the product testing phase to reveal students' misconceptions about the material of movement of the sun.

The data analysis technique consists of four activities, namely 1) collecting the misconceptions experienced by elementary school students 2) compiling the elements of three-tier diagnostic test and testing these students 3) analyzing the test results and classifying the test that were performed, and 4) conclusions.

Research tools have ranged from finding misconceptions about the movement of the sun in elementary schools experienced by the following students; (1) students believe that the sun sets in the sea (2), the sun is orange (3), the sun disappears at night (4), the sun is not a star (5) a solar eclipse is a phenomenon where the shadow of the moon obscures the sun.

For the combination of students' answers for each answer level using the following three-tier multiple-choice interpretation table;

Table-1: Interpretation of diagnostic test results Three-Tier Multiple Choice

Combination of answers			Classification of students' answers
tier 1	tier 2	tier 3	
Correct	Correct	Sure	Full understanding
Correct	Wrong	Sure	Misconception (+)
Wrong	Correct	Sure	Misconception (-)
Wrong	Wrong	Sure	Misconception
Correct	Correct	Not sure	Lucky / Lack of confidence
Correct	Wrong	Not sure	Not really understand
Wrong	Correct	Not sure	Not really understand
Wrong	Wrong	Not sure	No understand

(Arslan *et al.*, 2012)

Designing

Design stage in realization the instruments are as follows (Zaleha *et al.*, 2017): 1) Determining the material, 2) Creating a grid of test questions diagnosis, 3) Determine the shape of the test, namely form a three-tier test and 4) Writing test questions three-tier test with the resulting format as in Figure 1.

The format of the three-tier test: An example of the sun

The three-tier developed in this study consist of 1) the main question; 2) reason for answers; 3) confidence level. An example of the test of the sun concepts is presented in Table 1 below (the complete test items is available in Appendix 1).

Table-1: An example of the three-tier test format

Question: The main question about the sun conception the position of the sun in the afternoon
Answer Choice (tier 1): The position of the sun in the afternoon is... a. The sun sets in the sea. b. The sun sets on the mountain. c. The sun sets in the east. d. The sun sets in the west.
Reason (tier 2): The reason for my answer is... a. Because the earth surrounds us. b. Because the sun orbits the earth. c. Because the earth revolves around the sun. d. Because the sun disappears at night.
Confidence level in reason answer (tier 3) Are you sure with your answer? a. Sure b. Not sure

RESULTS AND DISCUSSION

Results and discussions on the development of diagnostic test for misconceptions about the movement

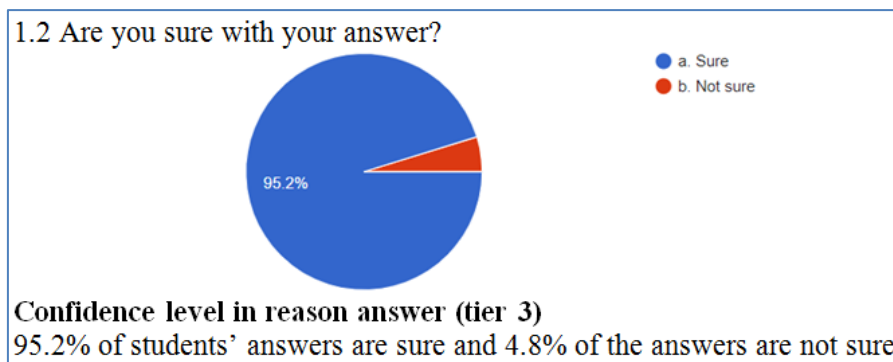
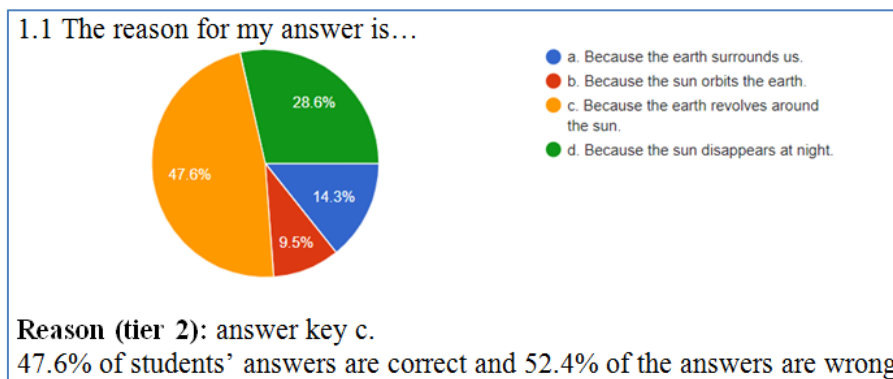
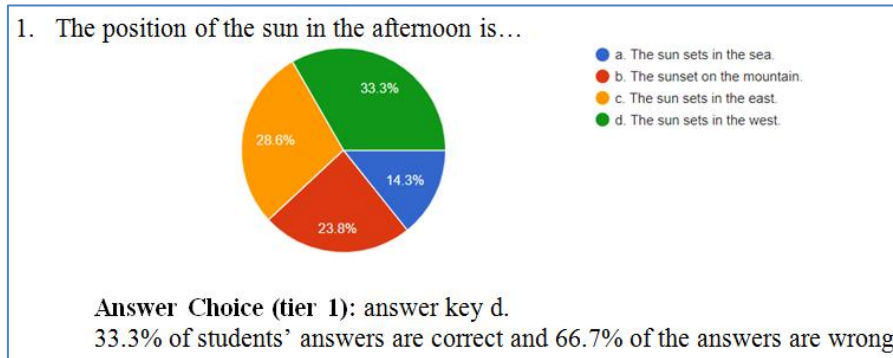
of the sun in elementary school about science materials that have been conducted descriptively. Based on research, five misconceptions about the movement of

the sun were found in elementary school students in Surakarta. Five misconceptions will be discussed in order.

- (1) Students believe that the sun sets in the sea,
- (2) the sun is orange,
- (3) the sun disappears at night,
- (4)

the sun is not a star, (5) a solar eclipse is a phenomenon where the shadow of the moon obscures the sun.

The first question for identifying misconceptions about “students believe that the sun sets in the sea and the sun disappears at night” in students is asked to answer question number 1.



Students 14.3% believe that the sun sets in the sea, 23.8% believe that the sun sets on a mountain, 28.6% believe that the sun sets in the east, and 33.3% believe that the sun sets in the west. The reason why students 47.6% of the reason is because the earth surrounds the sun while students 52.4% the reason is because the earth surrounds us because the sun surrounds the earth because the sun disappears at night. 95.2% most students are confident in their answers and their reasons. But in reality is wrong.

In this question, most of the answers from students still lacked understanding and the correct

answers were not up to 50% and above, so the results of grouping students' answers still faced misconceptions.

The second question for identifying misconceptions about “the sun is orange”

61.9% of students' think that the sun is actually orange, because in the afternoon students often see orange sunlight. Meanwhile, 33.3% of students' believe that the sun is actually yellow; the reason is that during the day students often see yellow sunlight. Meanwhile, the sun is a star because 4.8% of students believed that the sun was actually colored due to the fact that the color of the sun was a combination of

different colors and this is true. 95.2% most students are confident in their answers and their reasons. But in reality is wrong. In this question, most students' answers still face misconceptions.

The third question for identifying misconceptions about “the sun is not a star”

95.3% of students' believe that the sun is not a star. Students believe that the moon, setalit, and the earth include stars, while 90.5% of the students believe the reason is because the earth is a celestial body, because the satellite is not a celestial body, because the moon emits light. Whereas it's all wrong. In fact, the sun is a star because it has its own light and emits light. 90.5% most students are confident in their answers and their reasons. But in reality is wrong. In this question, a large number of students experienced misconceptions.

The fourth question for identifying misconceptions about “a solar eclipse is a phenomenon where the shadow of the moon obscures the sun”

90.5% of students consider that a solar eclipse is the shadows of the clouds obscured the sunlight; a solar eclipse is the shadow of the moon obscures the sun, a solar eclipse is the sun covers part or the entire moon, while all these are wrong answers. Only 9.5% of students' answer is correct, the answer is a solar eclipse, the moon obscures some or all of the sunlight.

For this reason, 66.7% of the students had the correct answer because it happened during the day, while 33.3% of the students had the reason because it happened at night. Because it happened in the month of Ramadan, and it happened on Eid day, even if it was wrong. 76.2% most students are confident in their answers and reasons. But in reality it is wrong. In this questions, a large number of students have experienced misconceptions.

This research is quite consistent with other studies that can diagnose students' misunderstandings. This leads to the further development of teacher learning and teaching management to be more effective and to reduce mistakes.

CONCLUSION

The research was to diagnose misunderstandings or misconception in the sun science course using a three-tier diagnostic test. By completing five test for elementary school students, in the topic (1) students believe that the sun sets in the sea, (2) the sun is orange, (3) the sun disappears at night, (4) the sun is not a star, (5) a solar eclipse is a phenomenon where the

shadow of the moon obscures the sun. The results of the tissue exam showed that most students still have many misunderstandings or misconception. This diagnostic test is useful for teachers in adapting teaching and learning and in developing teaching materials to create a correct understanding with students. The teacher's goal is to help students the learning process so that these students eventually do it have the skills to become lifelong learners.

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REFERENCES

- Abbas, M. L. H. (2016). Pengembangan Instrumen Three-Tier Diagnostic Test Miskonsepsi Suhu dan Kalor. *Ed Humanistics*, 1(2), 83–92.
- Arslan, H. O., Cigdemoglu, C., & Moseley, C. (2012). A Three-Tier Diagnostic Test to Assess Pre-Service Teachers' Misconceptions about Global Warming, Greenhouse Effect, Ozone Layer Depletion, and Acid Rain. *International Journal of Science Education*, 34(11), 1667–1686.
- Laksana, D. N. L. (2016). Miskonsepsi Dalam Materi IPA Sekolah Dasar. *JPI (Jurnal Pendidikan Indonesia)*, 5(2), 166-175.
- Pattiyatani, S. (2008). Educational measurement (6th ed.). Maharakam: Department of Research and Development, Maharakam University.
- Rukaiyah. (2021). interview by Fateemah Chewoh.
- Rupp, A.A., Templin, J., & Henson, R. A. (2010). *Diagnostic measurement: Theory, methods and applications*. New York: The Guilford Press.
- Suparno, P. (2013). *Miskonsepsi & Perubahan Konsep dalam Pendidikan Fisika*. Jakarta: PT Grasindo, 54.
- Zaleha, A. S., & Nugraha, M. G. (2017). Pengembangan Instrumen Tes Diagnostik VCCI Bentuk Four-Tier Test pada Konsep Getaran. *J. Pendidik. Fis. Dan Keilmuan*, 3(1), 36–42.
- Zhao, Z. (2013). An overview of studies on diagnostic testing and its implications for the development of diagnostic speaking test. *International journal of English linguistics*, 3(1), 41.
- Zulfikar, A., Samsudin, A., & Saepuzaman, D. (2017). Pengembangan Terbatas Tes Diagnostik Force Concept Inventory Berformat Four-Tier Test. *Jurnal Wahana Pendidikan Fisika*, 2(1), 43-49.

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