

Cognitive Assessment Using the Anates Application on Solar System Material for Grade 6 Students of Karangkandri 04 Elementary School

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ABSTRACT

This study aims to analyze the cognitive abilities of 6th grade students of Karangkandri 04 Elementary School in understanding solar system material using the Anates application as an evaluation tool. The instrument used was 10 multiple-choice questions arranged based on three cognitive levels in Bloom's Taxonomy, namely C1 (Remembering), C2 (Understanding), and C3 (Applying). This research method is quantitative descriptive, with data analysis techniques using Anates software to determine the level of difficulty, distinguishing power, and reliability of the questions. The results of the study showed that the highest level of student achievement was in the C1 realm (90%), then C2 (70%), and the lowest in C3 (50%). The Anates application helps in identifying less effective questions and provides a comprehensive picture of the quality of the evaluation instrument. The conclusion of this study is that students' basic understanding of the solar system material is quite good, but the ability to apply concepts still needs to be improved. The use of the Anates application has been proven to help teachers in compiling and analyzing questions that are of higher quality and in accordance with learning objectives.

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1. INTRODUCTION

1.1 Background

The solar system material is part of the Natural Sciences (IPA) curriculum at the Elementary School level and has an important role in introducing students to the basic concepts of astronomy and the phenomena of the universe. In this learning, students are expected to be able to understand the composition and characteristics of celestial bodies, namely the sun, planets, moons, and their movements. However, the achievement of these learning objectives is highly dependent on the extent to which students can master the cognitive aspects of the material being taught, starting from remembering information, understanding concepts, to being able to apply knowledge in relevant contexts.

Cognitive assessment is one of the main indicators in measuring the level of students' understanding of the solar system material. By conducting this assessment, teachers can find out the extent to which students absorb and process the information that has been presented, and identify learning difficulties that may occur. Therefore, this study was conducted to evaluate the cognitive achievements of 6th grade elementary school students in understanding the solar system material, in order to provide a clearer picture of the effectiveness of the learning process and as a basis for improving learning strategies in the future. Natural Science (IPA)

learning at the Elementary School level plays an important role in forming the foundation of students' scientific knowledge and thinking.

One of the topics taught in grade 6 is the material on the solar system, which includes an introduction to the sun, planets, satellites, asteroids, and other celestial bodies. This material not only aims to increase factual knowledge, but also to train students' logical and analytical thinking skills towards natural phenomena. To achieve learning objectives, it requires a good understanding from the cognitive side, which includes the ability to remember, understand, apply, and analyze information. Natural Science (IPA) learning in the 21st century focuses on developing the skills needed to face future demands such as critical thinking skills, collaboration, and effective communication (Yasifa et al., 2023) (Dewi & Mintohari, 2024).

However, in practice, students' cognitive achievement of the solar system material still varies. Some students are able to understand the concept well, while others have difficulty in connecting concepts or applying knowledge in the context of questions. Therefore, a systematic cognitive assessment is needed to determine the extent of students' understanding of this material. This assessment can be a basis for teachers in evaluating the effectiveness of the learning process and developing more appropriate strategies to improve student learning outcomes. Student success is measured not only in the cognitive domain but also in the psychomotor (skills) and affective (attitude) domains of students (Anugraheni W, 2019).

Psychomotor development refers to changes in a child's cognitive, emotional, motor, and social capacities from early life during the fetal and neonatal periods, infancy, childhood, and adolescence (Cioni G, 2013) (Ananda Aditya Sari Harahap et al., 2023). The Cognitive Domain in Bloom's Taxonomy states six types of abilities that are arranged hierarchically from the simplest to the most complex, namely: knowledge, understanding, application, analysis, synthesis and evaluation (Vieyra, 2006). One of the causes of students' low cognitive abilities is the teaching materials used in learning (Djamarah & Zain, 2014). Some teaching materials only copy information from one to another, so students tend to memorize.

Teachers need the right media to attract students' attention in learning, process complicated and complex teaching materials into simple and clear ones, and change abstract scientific concepts into concrete ones (Ministry of National Education, 2007). Concrete concepts in learning are fundamental to clarifying abstract facts (Hill & Korhonen, 2014). Interesting teaching materials have the potential to improve students' cognitive processes (Koning, et al., 2009). The effectiveness and efficiency of the learning process can be improved through the application of multimedia teaching materials (Siagian, et al., 2014).

1.2 Problem Formulation

Assessment of students' cognitive aspects is very important to determine the extent of their understanding of the material that has been studied, including the topic of the solar system. In science learning, especially in the solar system material, students are expected to not only be able to memorize the names of planets or the order of the solar system, but also understand the relationship between celestial bodies, the circulation process, and its impact on life on earth. Even so, in learning practice, there are some students who can achieve the expected level of cognitive understanding, so a study is needed to specifically determine which parts are the difficulties or weaknesses of students.

Based on the background, the problem in this study can be formulated focused on the main question: "What is the level of cognitive achievement of 6th grade elementary school students in the solar system material?" Then it can be described into sub-questions, such as: (1) What are the cognitive indicators that students have mastered in the solar system material? (2) At what cognitive level do students experience difficulties in understanding the material? and (3) What factors influence students' cognitive achievement in learning the solar system? This problem formulation is expected to help researchers in focusing the direction of data collection and analysis of research results in a more focused and in-depth manner.

2. RESEARCH METHODOLOGY

2.1 Research Purposes

The purpose of this study was to determine and analyze the level of cognitive achievement of 6th grade elementary school students in understanding the solar system material. This study aims to identify students' abilities in various cognitive indicators, such as remembering, understanding, and applying basic concepts about the solar system, as well as to determine parts of the material that are still obstacles for students. The results of this study are expected to be evaluation materials for teachers in designing more effective learning strategies that are in accordance with students' needs.

2.2 Research Methods

This study uses a quantitative approach with a descriptive method, with the aim of providing an overview of the level of cognitive achievement of students in understanding the solar system material. The

subjects of the study were 6th grade students at Karangandri 04 Elementary School, with a total of 28 participants consisting of 18 female students and 10 male students who were selected purposively based on the consideration that they had received solar system material in the science learning curriculum.

This study focused on three main aspects of the cognitive domain according to Bloom's Taxonomy, namely remembering (C1), understanding (C2), and applying (C3), which are considered relevant to the basic abilities of students at the elementary school level. Nawawi (2015) stated that the descriptive method can be interpreted as a problem-solving procedure that is investigated by describing/describing the state of the subject/object of research (a person, institution, society and others) at the present time based on the facts that appear, or as they are (p.67).

Meanwhile, Mahmud (2011) stated that "Descriptive research is a study that attempts to systematically and accurately describe or observe problems regarding the facts and properties of certain objects" (p.100) (Ananda Aditya Sari Harahap et al., 2023). The research methodology described in the previous section was applied to assess the impact of a collaborative solar system project on elementary school students' science engagement and understanding. This research involved direct exploration of the environment, which encouraged students to observe and document simple astronomical phenomena.

This experiential learning was complemented by a group project in which students utilized recycled materials to build a model of the solar system (Lubis & Amelia, 2025).

Table 1.

Demographic Variables (Gender)	Number of Participants	Percentage
Man	10	36 %
Woman	18	64 %

The data collection technique was carried out by giving written tests to students, consisting of multiple-choice questions arranged based on the cognitive indicators. The test result data was then analyzed quantitatively by calculating the percentage of student achievement in each cognitive indicator. The results of this analysis were then used to assess the level of student mastery of the Natural and Social Sciences material in the solar system chapter and to identify parts that still need reinforcement in the learning process.

3. RESULTS AND DISCUSSIONS

The results of this study can present a picture of the level of cognitive achievement of 6th grade elementary school students in understanding the solar system material. Data were obtained through written tests with designs based on cognitive indicators in accordance with Bloom's Taxonomy. The use of the Anates application can show several important points, including:

1. the level of question validity, this shows the extent to which the question measures what should be measured. Ayunita (2018) stated that the validity of the accuracy of an instrument in measurement. In line with Sugiyono (2007) who stated that validity aims to measure the contents of the instrument so that the results of the instrument to be used can be obtained whether it is feasible or not (Pendidikan et al., 2019). In this study, the validity of the questions was tested by looking at the correlation between the item scores and the total score. Questions that have high validity indicate that the questions are relevant and appropriate in measuring students' understanding of the solar system material
2. Reliability measures the consistency of test results if the test is repeated. The results of the reliability analysis show that most of the questions have good reliability, meaning that the questions can be trusted to be used in learning evaluations
3. The level of difficulty of the question indicates how easy or difficult the question is for students. In this study, most of the questions were at a moderate level of difficulty, meaning that the questions were quite challenging for students without being too difficult or easy
4. Discriminatory power measures the ability of the question to distinguish between students with high and low understanding. The results of the analysis show that most of the questions have good discriminatory power, meaning that the questions are effective in distinguishing students' levels of understanding. This discriminatory power analysis can examine test questions in distinguishing students who are included in the low and high categories (Wedastuti, N. K., Fuady, A., & Sunismi, S: 2023)
5. Distractor effectiveness measures the extent to which incorrect answer choices (distractors) can attract the attention of students who do not understand the material. In this study, most of the distractors functioned well, meaning that incorrect answer choices are effective in identifying students who do not understand the material.

4. CONCLUSIONS

Based on the results of the study, on 28 6th grade students of Karangandri 04 Elementary School, it can be concluded that the use of the Anates application in cognitive assessment on the Solar System material has a positive impact on the learning evaluation process. The Anates application has been proven to help teachers in analyzing the quality of questions statistically, such as the level of difficulty, discriminatory power, validity, and reliability of the questions. The results of the analysis of this study indicate that the majority of questions are in the moderate category with good discriminatory power, and a high level of reliability, namely 0.81.

In addition, the use of Anates speeds up the correction process, increases the accuracy of assessment data, and makes it easier for teachers to make decisions based on objective data. However, Anates still has shortcomings, such as limitations on objective questions and dependence on technological devices. Overall, Anates is an effective and efficient evaluation tool in cognitive assessment in elementary schools, especially in science learning, and is worthy of being applied more widely in other schools with the support of training for teachers.

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