

ANALYSIS OF STUDENTS ABILITY TO SOLVE SPEED OPERATION PROBLEMS IN ELEMENTARY SCHOOL

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ABSTRACT

This research aims to analyze the ability of elementary school students to solve mathematical problems related to speed operations. This ability is important because it relates to the application of the concept of speed in daily life and science. The research uses qualitative methods and observation, where students are given story problems with a level of higher-order thinking skills. (HOTS). The research results show that many students have difficulty understanding the questions, writing the steps to solve them, and applying the speed formula correctly. Out of 13 respondents, only 4 were able to answer some questions correctly. The main factor causing this mistake is the lack of overall understanding of the material. This research recommends the importance of intensive practice questions and more systematic guidance from educators to improve students' problem-solving skills.

Keywords: Problem-Solving Ability, Speed Operations, HOTS, Elementary School, Mathematics Learning.

A. INTRODUCTION

Education at the elementary school level indeed occupies a position of exceptional significance in the overall development of children, as it lays the groundwork for their future learning and personal growth. More specifically, the domain of mathematics education, particularly at the elementary stage, serves not only to refine the cognitive skills of young learners but also to establish a robust foundational framework that is essential for their subsequent educational endeavors, practical life skills, and the cultivation of critical as well as creative thinking capabilities. This foundational development is particularly imperative in our contemporary society, where the prevailing trends within the educational landscape tend to prioritize convergent thinking—characterized by a focus on finding a single correct answer—over the more expansive and innovative approaches associated with divergent thinking, which encourages multiple solutions and creative problem-solving. Regrettably, it is a matter of considerable concern that despite the critical importance and multifaceted roles that mathematics education plays in nurturing children's cognitive and analytical skills, there has been a noticeable decline in the enthusiasm and interest displayed by elementary school children toward the subject of mathematics over time.

Recent findings reported by the Ministry of Education and Culture (Kemendikbud) indicate that approximately 52% of elementary school children exhibit a marked disinterest in the pursuit of mathematical learning, while an additional study conducted by Yogyakarta State University reveals that around 55% of elementary school students are similarly characterized by their low levels of interest in the discipline of mathematics. Clearly, this pervasive lack of enthusiasm among students toward mathematics education has emerged

as a significant challenge that educators routinely confront as they strive to engage and inspire their pupils in this crucial area of study.

Mathematics learning constitutes a fundamental component of one of the most essential branches of knowledge that students encounter throughout their educational journey. In our daily lives, the role of mathematics extends far beyond mere academic study, as it serves as a vital tool for the effective communication of information. This communication is frequently manifested through the use of mathematical language, which not only facilitates the transmission of information but also enhances individuals' abilities to think in a systematic and critical manner, thereby fostering greater levels of creativity among learners. The process of mathematics learning within the context of Elementary School (SD) is therefore critical, as it equips students with the necessary understanding of mathematical concepts that are vital to their personal and academic success. The primary objective of mathematics education within the elementary school framework is to enable students to systematically approach and solve a variety of problems that are pertinent to real-life scenarios. Ultimately, the overarching aim of mathematics education in schools is to cultivate proficient mathematical skills in students, empowering them to adeptly navigate and solve the various challenges they encounter in their everyday lives.

The development of problem-solving abilities among students is recognized as one of the key competencies that must be effectively fostered during the elementary school years. However, one particular aspect that frequently presents challenges is the comprehension of speed operations within mathematics instruction. The concept of speed, which intricately links the dimensions of distance and time, holds considerable relevance not only within the realm of mathematics but also in a variety of practical contexts encountered in daily life as well as in the natural sciences. Within the framework of the elementary school curriculum, the concept of speed is introduced at an advanced level; however, a comprehensive understanding of this concept typically necessitates the possession of mature logical and analytical reasoning skills. Consequently, it becomes crucial to analyze students' capabilities in solving problems related to speed operations, as doing so allows for a better assessment of their understanding and application of this important concept. The primary goal of this article is to conduct a thorough analysis of students' abilities to address problems associated with speed operations. Through this analytical process, it is anticipated that various factors influencing students' comprehension can be elucidated, along with the identification of more effective pedagogical strategies aimed at enhancing students' problem-solving competencies in this particular context.

B. RESEARCH METHOD

In accordance with the overarching research objective, which aims to meticulously assess and ascertain the proficiency and capability of elementary school students in effectively addressing and resolving mathematical problems specifically centered around the concept of speed, it is essential to categorize this particular research endeavor as a distinctive form of qualitative research that not only emphasizes the importance of observational methods but also integrates comprehensive data collection techniques to thoroughly analyze the cognitive processes involved in problem-solving among young learners.

C. RESULTS AND DISCUSSION

The intricate and multifaceted topic of distance, speed, and time represents a compelling area of study within the realm of mathematics education, eliciting not only intellectual curiosity but also practical relevance. This concept, which serves as a cornerstone in the mathematical curriculum, has extensive implications in the fabric of everyday life, particularly when examined through the lens of travel and transportation logistics. Within this educational framework, students are meticulously instructed on how to determine the distance traversed by an object or vehicle, employing mathematical principles that relate speed to time spent in motion. Speed, as a fundamental parameter, is quantitatively defined as a measure of the rate at which an object moves through space. In our daily vernacular, we frequently encounter descriptive terms such as "fast" and "slow," which serve to characterize the relative velocity of moving objects. Specifically, speed articulates the distance an object can cover within a designated time interval. For instance, consider a scenario in which an automobile covers a substantial distance of 100 kilometers over a span of 2 hours; through this example, one can elucidate the method of calculating the vehicle's speed, providing insights into practical applications of this mathematical principle.

The concept of speed is not only a fundamental topic in mathematics but also occupies a significant position within the domain of physics, where it elucidates the dynamics of how swiftly an object is traveling through space. Within the educational context of a 4th-grade classroom, the teaching of speed is often approached with a focus on simplicity and practical application, ensuring that students grasp the underlying principles without becoming overwhelmed by complexity. Speed can be quantitatively expressed in a variety of units, with kilometers per hour (km/h) and meters per second (m/s) being the most prevalent and widely utilized in everyday contexts. To accurately compute speed, it is imperative to ascertain both the distance traveled and the time expended in covering that particular distance. For example, if one were to analyze a situation where a vehicle travels a distance of 150 kilometers over a duration of 3 hours, the speed of the vehicle can be derived by performing a division of the total distance by the time taken. In this illustrative case, the mathematical operation of 150 kilometers divided by 3 hours yields a resultant speed of 50 kilometers per hour, thereby demonstrating a practical application of the principles of distance, speed, and time.

Beyond the fundamental calculation of speed, it is equally essential for students to cultivate an understanding of the notion that speed is not invariably constant and can fluctuate due to a myriad of influencing factors. Numerous variables can significantly impact speed, including but not limited to road conditions, atmospheric weather, and the specific characteristics of the vehicle in motion. For instance, one might observe that an automobile cruising along a well-maintained highway will generally achieve a higher speed in contrast to a vehicle ensnared in the congestion of urban traffic. Grasping this nuanced concept of speed is vital for students, as it equips them with the analytical tools necessary to navigate various situations encountered in their daily lives. By being cognizant of the time required to travel to educational institutions or other destinations, students can optimize their time management strategies effectively. For instance, if a student is aware that their cycling speed is 10 kilometers per hour, they can easily calculate the duration needed to arrive at a school located 5 kilometers away, thereby enhancing their planning capabilities.

Through the exploration of speed, students are afforded the opportunity to gain a deeper comprehension of the myriad phenomena that surround them, including the rationale behind why vehicles that operate at higher speeds can arrive at their destinations in a timelier manner and how alterations in speed can influence road safety considerations. Developing an awareness of speed, along with the myriad factors that can affect it, constitutes a foundational step towards cultivating a more profound understanding of the principles of physics, as well as their multifaceted applications in the quotidian experiences of life.

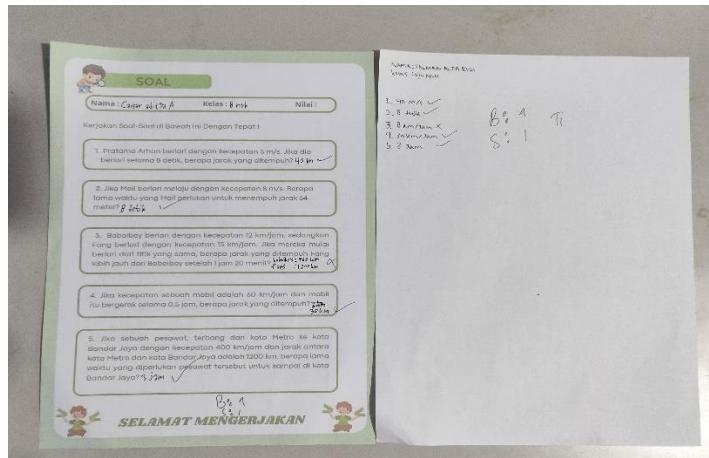
The subject of velocity in the realm of mathematical education holds significant importance for learners, particularly at the foundational stage of elementary schooling, where the cognitive frameworks for future learning are established. A comprehensive grasp of the concept of speed not only facilitates students in honing their logical reasoning abilities but also aids in nurturing their analytical thinking proficiencies, which are crucial for their overall intellectual development. Within the confines of this educational module, students are introduced to the fundamental equation that governs the computation of speed, articulated as speed being equivalent to the distance traveled divided by the time taken to traverse that distance. For instance, when presented with a scenario that depicts the journey from a student's residence to their educational institution, they can effectively deduce the duration of that journey if they are provided with the specific distance and their travel speed. Furthermore, this academic content enriches students' comprehension of diverse units of measurement, such as kilometers per hour (km/h) and meters per second (m/s), which are essential for quantifying speed accurately. This understanding is particularly vital as students frequently encounter the practical application of speed in their daily lives, whether it be in the context of commuting via various modes of transport or engaging in physical exercise and recreational activities. Effective pedagogical approaches to teaching speed encompass not only theoretical frameworks but also integrate experiential learning opportunities, such as the practical measurement of distance and time during routine activities, thereby allowing students to observe tangible manifestations of the abstract concepts they are studying. Consequently, addressing the students' educational needs regarding the mathematical principles of speed serves to significantly augment their proficiency and capability in resolving real-world problems they may confront in their everyday experiences.

To evaluate the comprehension of speed-related concepts among elementary school students, we systematically employ observational data as a primary tool for assessment. This evaluative observation was meticulously conducted by presenting a series of Higher Order Thinking Skills (HOTS)-level inquiries designed to challenge the students' cognitive abilities. The subsequent analysis entails a comprehensive delineation of each student's responses as they navigate the complexities of mathematical problem-solving tasks concerning speed, particularly within narrative-based problems that were formulated by the researcher. Each student's response is meticulously categorized based on the distinct types of analytical errors that they exhibit during the problem-solving process, thus providing a nuanced understanding of their grasp of the speed concept.

In the intricate process of responding to the posed inquiries, it was discovered that one particular student had inadvertently committed an error in the articulation and

documentation of the various stages and steps involved in providing a comprehensive answer to the questions presented.

Gamba: 1. The work result of the first respondent

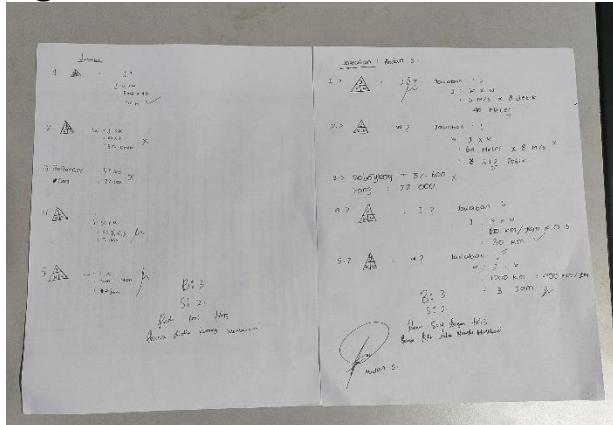


(R-1) who made a mistake in the step of writing the steps. (True 4)

Drawing upon the data illustrated in Figure 1 presented above, it becomes evident that the students exhibit a commendable level of comprehension concerning the posed questions, which is clearly demonstrated by their capacity to successfully provide correct responses to four out of the five inquiries that were administered to them. Nevertheless, it is important to note that the students failed to document the procedural steps involved in their problem-solving endeavors, such as identifying the known variables, articulating the questions being asked, and delineating the relevant formulas that should have been applied in order to arrive at the solutions. This oversight can be attributed to a significant misunderstanding on the part of the students regarding the instructions that were communicated by the educator, leading to a disconnection between their cognitive understanding and their practical application of the problem-solving process. Ultimately, this situation highlights the critical need for educators to ensure that their instructions are conveyed with clarity and precision, so as to facilitate a more effective learning environment where students can fully engage with and demonstrate their understanding of the material presented to them.

Error in applying the formula to one of the questions

Image: 2. The work results of the second respondent

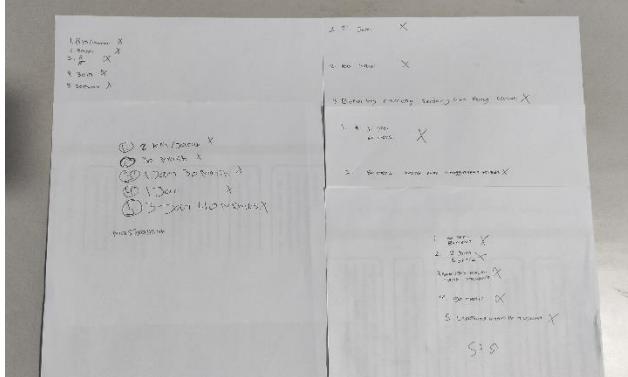


(R-2) made mistakes in the application of the formula that were not accurate. (correct 3 using method)

In light of the visual representation provided, it is evident that the students have made a fundamental error in their application of the speed calculation formula, which is a critical concept in the field of physics. This erroneous interpretation is clearly illustrated in their work, where they incorrectly expressed the relationship as distance multiplied by speed, thus demonstrating a misunderstanding of the underlying principles, whereas the accurate formulation should be articulated as distance divided by speed, reflecting the correct mathematical operation necessary for determining speed. Such misconceptions highlight the importance of a thorough comprehension of scientific formulas, as proper application is essential for achieving accurate results in various practical scenarios.

Mistake in understanding the question

Image: 3. The work results of the fourth respondent



(R-4) made a mistake by completely misunderstanding the question.

Upon careful examination of the aforementioned image 4, it becomes increasingly apparent that there exists a significant number of students who continue to grapple with the comprehension of the questions presented to them. This observation is substantiated by the fact that out of the five questions posed, not a single one was answered correctly by any of the respondents, highlighting a concerning gap in understanding.

In light of the findings derived from the analysis of students' performance on story problems categorized at the levels of Lower Order Thinking Skills (LOTS), Medium Order Thinking Skills (MOTS), and Higher Order Thinking Skills (HOTS) concerning the topic of speed, the researcher has reached the conclusion that the proficiency of elementary school students in relation to the subject of speed is alarmingly inadequate. Among the 13 participants who engaged with the questions, a mere four individuals managed to provide correct answers to some of the inquiries posed, which underscores the challenges faced by the majority. The errors encountered by the students can be attributed to a variety of factors, including but not limited to difficulties in comprehending the questions, inaccuracies in documenting the steps taken towards the answers, and challenges in the application of relevant formulas. The underlying reasons contributing to these difficulties appear to stem from the observation that a substantial number of students have not yet fully grasped the material at hand and remain bewildered regarding the proper formulation of the speed equation. To address the identified challenges, a potential solution that could be implemented involves the provision of practice questions on a regular basis, thereby reinforcing the students' understanding and application of the material.

In summation, the results gleaned from this analysis indicate that within the educational process, mere comprehension of concepts is insufficient to ensure the attainment of favorable outcomes; it is equally critical to possess a thorough understanding of how to correctly apply formulas, accurately interpret instructions, and systematically articulate the steps involved in problem-solving. This revelation points towards the urgent necessity for educators to enhance their guidance in relation to helping students better understand

instructions while also promoting more structured methodologies for tackling problems effectively.

D. CONCLUSION

The culmination of the instructional material regarding speed, tailored specifically for fourth-grade elementary school students, unequivocally illustrates that speed constitutes a fundamental and pivotal concept within the realm of mathematics, which significantly aids students in comprehensively grasping the intricate relationships that exist between the variables of distance, time, and rate of travel. Throughout this educational lesson, learners are systematically instructed on the methodology for calculating speed by utilizing the foundational formula, which is succinctly expressed as speed = distance divided by time. Mastery of this essential formula is of paramount importance, as it empowers students to proficiently compute the duration required to traverse a specified distance at a predetermined speed, or, conversely, to ascertain the speed when the distance and time parameters are already established.

In addition to this, students are introduced to a variety of units utilized for measuring speed, including kilometers per hour (km/h) and meters per second (m/s), which are crucial for a comprehensive understanding of the concept. The introduction and exploration of these measurement units hold significant educational value since students are likely to encounter the concept of speed in their daily lives, particularly during activities such as cycling, walking, or traveling in various vehicles. By acquiring a firm grasp of the conversion processes between different units of speed measurement, students are afforded the opportunity to further refine and enhance their mathematical proficiency and competencies.

Moreover, the learning experience surrounding the topic of speed extends beyond mere theoretical considerations; therefore, practical activities are strongly advocated to furnish students with invaluable hands-on experience that solidifies their understanding and application of the concept. For instance, educators may invite students to engage in straightforward experiments that involve measuring travel times during running or cycling activities conducted in an outdoor setting. Such experiential learning opportunities not only facilitate students in observing the tangible, real-world applications of the speed concept but also serve to reinforce and deepen their comprehension of the material being presented in the classroom.

Furthermore, a nuanced understanding of speed contributes significantly to the cultivation of critical and analytical thinking abilities among students, as they learn to effectively tackle and resolve problems that pertain to the calculations of distance and time. The skills developed through these exercises prove to be advantageous and beneficial across a multitude of life scenarios, including the ability to more effectively plan trips and to gain insights into how speed influences safety considerations while operating a vehicle.

In summary, the educational material concerning speed that is presented to fourth-grade elementary school students lays a robust and solid foundation for their understanding of essential mathematical and physical concepts, along with the practical applications that arise in their everyday lives. By cultivating a thorough comprehension of speed, students not only enhance their mathematical capabilities but also acquire practical skills that will undoubtedly prove beneficial and useful in their future endeavors and experiences.

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