

EFFORTS TO IMPROVE UNDERSTANDING OF COMPARISON CONCEPTS USING PAPER MEDIA IN ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

This study aims to improve understanding of the PAPER (Comparison Board) media concept. Many students lack understanding of the concept of comparison material and lack seriousness in learning. This may be due to overly monotonous learning methods. The researcher used PAPER learning media to increase student motivation in learning and make learning more interesting. The object of the mathematics education research, especially on comparison material used for children at the Nurul Iman TPA on October 1, 2024, was the children of the Nurul Iman TPA, ranging from grades 4 to 6, numbering around 20 people. The research method used was qualitative. Qualitative research is defined as a research method that focuses on obtaining data through communication and open conversation. The result of this study was that after using the PAPER (Comparison Board) media, the children were interested and enjoyed using it. This media can help solve problems involving comparisons so that they can find the formula themselves. We can see that learning using the PAPER media can also improve students' skills and activity in the learning process.

Keywords: understanding, comparison, motivation

A. INTRODUCTION

Mathematics is often celebrated and referred to as the Queen of Science, or more broadly, the sovereignty of all academic disciplines. This title is certainly not just decoration or hyperbole, especially when one considers that mathematics functions as a basic and universal language that supports various other fields, ranging from natural sciences such as physics and chemistry, to social sciences such as economics, and even extending to the realm of modern information technology and computer science. From an epistemological perspective, mathematics can be described as a domain characterized by a highly logical, systematic, and hierarchical framework of knowledge. In this structured environment, it is crucial to realize that no mathematical concept exists in isolation; rather, it is carefully arranged in a progressive sequence that spans from the most basic principles to more intricate and complex theories. Consequently, a lack of understanding or comprehension at one level of this conceptual hierarchy will inevitably lead to systematic challenges and difficulties when attempting to understand the ideas presented at the next level.

At the elementary education stage, the acquisition and mastery of mathematical skills are of paramount importance. Elementary school, or the primary school phase, represents a critical period of development in which the basic elements of students' logical reasoning, critical thinking, and analytical abilities are initiated and established. During this formative phase, students engage in more than just mechanical calculation processes; they are actively

encouraged to cultivate structured thinking processes and logical frameworks that will benefit them in their future academic endeavors. The presence of strong mathematical skills developed at an early age is considered a significant predictor of students' academic success later in life, impacting not only their performance in scientific subjects but also enhancing their overall problem-solving abilities, which are essential for navigating the various challenges encountered in everyday life.

Despite the undeniable significance of mathematics in education, the reality observed in practice reveals a considerable gap between the expectations set by the curriculum and the actual abilities demonstrated by students in the classroom. Many learners often perceive mathematics as a daunting or overwhelming subject, sometimes even labeling it as a “bogeyman” that they fear. According to various educational research findings conducted in Indonesia, low student performance in mathematics is not an isolated incident; rather, it is a complex phenomenon that arises from the interaction of various intertwined factors.

In a broader context, four main factors can be identified as the dominant influences contributing to low academic achievement in mathematics. The first factor relates to a lack of interest among students. Interest serves as the main driving force behind the learning process; without genuine interest, knowledge transfer is significantly hampered, mainly due to students' lack of emotional connection and engagement with the material being taught. The second factor involves a noticeable decline in concentration levels. In this digital age, it has been observed that students often exhibit shorter attention spans, and without an engaging and stimulating learning design, their concentration can be easily diverted by external stimuli unrelated to the subject matter being studied. The third factor relates to a superficial understanding of mathematical concepts. Often, classroom teaching tends to emphasize memorizing formulas without investigating the basic principles that justify their application, leading to a situation where students' knowledge is shallow and ephemeral, quickly forgotten once the immediate context is removed. The fourth and final factor is the issue of discipline, which is essential for mastering mathematics. This subject demands consistent practice and diligent effort; without a high level of learning discipline, mastery of the material will stagnate and fail to progress to more advanced stages of understanding.

In the basic mathematics curriculum designed for elementary school students, subject matter known as comparative material plays an important role by acting as a vital channel through which students can transition to a deeper understanding of advanced mathematical concepts, including but not limited to algebra and statistics. However, it is important to note that this particular topic is also one of the most critical points where a significant number of students begin to struggle and subsequently fall behind in their academic progress. The fundamental idea of comparison requires students to understand the quantitative relationship that exists between two or more items or entities, which are often abstract and not easily visualized in concrete terms.

A large number of students struggle to appreciate the idea that comparisons go beyond simple subtraction or addition; rather, they represent complex multiplicative relationships that require a deeper understanding. Limited understanding of this concept is often rooted in students' inadequate engagement and seriousness toward their learning efforts, the lack of which is often exacerbated by repetitive and uninspired teaching methodologies used in the classroom. Educators often find themselves trapped in a monotonous lecture format, where the blackboard becomes a mere canvas filled with lifeless numbers, devoid of meaningful visual representations that could enhance understanding. Consequently, this leads to a situation where students adopt a passive learning attitude, gradually losing their motivation, and ultimately struggling to achieve the basic competencies expected of them at this stage of their education. Furthermore, the absence of contextual learning experiences causes students to question the relevance and application of comparative material in real-life situations, which in turn reduces their interest and curiosity in the subject matter.

To fully understand why students find the topic of comparison so challenging, it is important to examine Jean Piaget's influential theory of cognitive development, which offers valuable insights into the learning processes of young children. Typically, students in the elementary school age range of 7 to 12 years old are in what Piaget categorized as the concrete operational stage of cognitive development. During this crucial developmental phase, although these young learners have the capacity for logical thinking, their cognitive processes remain heavily dependent on real-world objects that they can physically observe and manipulate. If they are suddenly confronted with abstract symbols or mathematical variables without the aid of visual or manipulative aids, they tend to experience significant difficulty in understanding and applying these concepts.

A critical oversight in mathematics instruction during this developmental period is the tendency to “jump straight” into abstract concepts—such as numerical symbols—before providing students with sufficient concrete experiences that allow them to build a solid foundation. This highlights the urgent need for intermediary media that can facilitate the learning process. Without the use of physical props or visual aids, the concept of comparison risks becoming a difficult idea that remains beyond the reach of young children's logical reasoning abilities. Therefore, it is important that a transformative approach be adopted in the way educators present this material, particularly by integrating various learning tools and resources that simplify the complexity of the content into tangible and relatable forms, ultimately fostering a more effective learning environment.

In the ongoing quest to improve student motivation and understanding in educational settings, it is becoming increasingly clear that the incorporation of various learning media is not just an optional enhancement, but rather an essential requirement that must be met. The term “learning media” is technically categorized as any tool or resource that serves the purpose of delivering a specific message from the sender—usually the educator—to the recipient, which in this context refers to the student. This transmission is

intended to stimulate learners' cognitive processes, as well as their emotional responses, attention, and overall interest, thereby facilitating a more effective learning process conducive to deep understanding.

To be considered effective, learning media must adhere to the basic principles of being “active and enjoyable.” The term “active” indicates that the media must incite the physical and mental engagement of students, involving them in ways that go beyond mere passive observation or superficial involvement. Meanwhile, “enjoyable” indicates that the media must have the capacity to reduce any anxiety students may experience regarding subject matter, such as mathematics. With the appropriate use of such media, the educational paradigm shifts from a traditional teacher-centered approach to a more interactive student-centered methodology. Within this new framework, media serves as an invaluable tool that provides students with immediate feedback on their level of understanding, allowing educators to transition into the role of facilitators rather than being viewed solely as the primary source of knowledge.

Given the discomfort that stems from a lack of clear understanding of dry and monotonous concepts such as comparison and learning, the author has embarked on a journey aimed at developing innovative learning media, aptly named PAPER (Comparison Board). This medium has been carefully designed with the specific intention of bridging the significant gap that exists between the abstract idea of comparison and the real-world realities that elementary school students encounter every day.

PAPER goes beyond the characteristics of a conventional blackboard; it is a carefully crafted interactive tool with a variety of colors, shapes, and components that students can manipulate themselves with their own hands. Through the use of PAPER, students are given the opportunity to visually observe how certain values change in relation to other values within a comparative framework. This medium effectively integrates visual, auditory, and kinesthetic (VAK) modalities, ensuring that the diverse preferences and learning styles of all students are comprehensively accommodated.

The anticipated implementation of PAPER is expected to mark a remarkable transformation in the classroom environment. Learning sessions are poised to evolve from boring and anxiety-inducing experiences to dynamic explorations filled with curiosity and discovery. Instead of merely memorizing facts, students will be empowered to witness firsthand how comparisons work on this engaging board. The simplicity of understanding the material through the use of PAPER media is projected to boost students' confidence, which, in turn, is likely to increase their interest, focus, and overall academic performance.

In short, the development of PAPER media is a tangible and proactive response to the multifaceted challenges currently faced by mathematics education in the contemporary era. By combining insights from the field of child psychological development, addressing common problems in the classroom learning environment, and utilizing the potential of educational media, the author firmly believes that the improvement of mathematics education must begin with innovative practices at the elementary level. Through the application of PAPER media, it is anticipated that the previously

complex concept of comparison will be made simpler, more interesting, and significantly more effective for students. As a result, the quality of student learning outcomes is expected to improve not only quantitatively, as reflected in numerical assessments, but also qualitatively, manifested as a deep and lasting understanding of important concepts.

B. METHOD

The research methodology used in this article is essentially characterized as a descriptive qualitative method, carefully designed to produce rich and nuanced insights. The choice of this qualitative approach was primarily driven by the research objective to thoroughly explore and investigate the complex phenomena surrounding mathematics learning in primary education settings, with a particular emphasis on the comparative materials used in the instructional process. Unlike quantitative research methodologies, which largely concentrate on numerical data and statistical analysis, qualitative methods are clearly oriented towards data collection through engaging two-way communication and open dialogue; this strategy aims not only to illuminate “what” happens in the classroom but also seeks to uncover the underlying “why” behind the attitudes and behaviors exhibited by students and educators in relation to the instructional content being taught.

From an epistemological perspective, qualitative research is firmly rooted in the basic principles of social sciences, particularly psychology and sociology, which provide a strong framework for understanding human experiences. In this academic context, researchers strategically use this qualitative approach to investigate the various motivations, emotional responses, and obstacles students face when grappling with abstract concepts related to comparative mathematics. By utilizing a variety of data collection techniques such as in-depth interviews and participatory observation, researchers are given the opportunity to ask follow-up questions that arise organically from participants' initial responses. This methodological flexibility allows researchers to achieve a deep and comprehensive understanding of how the target audience views and interacts with the PAPER learning media, specifically known as the Comparison Board.

The research methods were carefully designed to effectively uncover student behavior and responses during the learning process, thereby providing a window into their cognitive and emotional engagement. By placing significant focus on the quality of classroom interactions and the depth of student perceptions, this research aspires to offer an authentic representation of the effectiveness of PAPER media as a pedagogical tool. Furthermore, it seeks to explain how this innovative medium can transform the learning environment into one that is more dynamic, interactive, and enjoyable compared to traditional teaching methodologies, ultimately fostering an atmosphere that is more conducive to student learning and participation.

C. RESULTS AND DISCUSSION

Elementary School Mathematics Learning

According to research conducted by Yeti E.Y. in 2020, mathematics emerges as a subject that we encounter every day, making it almost impossible to ignore its significance in our daily lives. The lexicon associated with mathematics comes from various disciplines, demonstrating its interdisciplinary nature. In a textbook written by Nasution, it is interesting to note that mathematical concepts are closely related to Sanskrit, specifically referring to terms such as *medha* or *widya*, which inherently convey ideas of expansion, comprehensive understanding, and a sense of consistency in thought and application.

1. In the field of mathematics education, there are many factors that can greatly influence the learning outcomes experienced by students. These factors can be broadly categorized into two distinct groups: factors inherent to the learners themselves, which we refer to as internal factors, and factors that originate from external influences, which we classify as external factors. Factors originating from within students, known as internal factors, include various elements such as students' interest in the subject, their innate talents, the effort they are willing to put in, their cognitive abilities, the level of attention they can maintain, any weaknesses they may have, their state of motivation, established learning habits, and their physical and mental health.
2. One of the most important aspects of engaging in learning activities that must be strongly instilled in students is the understanding that their educational efforts are fundamentally driven by their own needs and aspirations, not just external pressures or requirements.

When discussing the physical and non-physical environmental factors that play a role, we must consider a range of elements including the overall classroom atmosphere during learning sessions, the socio-cultural context in which students find themselves, the family environment of which they are a part, the educational programs implemented by their school (including the level of support provided by the school committee), the influence of teachers, the implementation of actual learning practices, and the existence of peer relationships within the school setting, as highlighted by Sumarjan in 2017.

In the context of mathematics learning specifically designed for elementary school students, it is crucial that the teaching methodology used is based on real experiences and is aligned with the concepts of the material being studied. It is important to recognize that learners typically range in age from six or seven to twelve or thirteen years old, during which they are still navigating the concrete operational phase of cognitive development, as outlined by Ratu Atik and Rifqi Rijal in 2016. As a result, it is very appropriate to combine various media or teaching aids that facilitate the transformation of abstract mathematical ideas into more concrete and understandable forms.

The insights shared by Dienes, as referenced in Ruseffendi's work, explain that any mathematical concept or principle presented concretely will be significantly easier for students to understand and comprehend. This highlights the importance of engaging students with objects or tools that can be manipulated in a fun way, as this can play an important role in teaching mathematical concepts effectively when used appropriately, as noted by

Ruseffendi in 1995. The overall goal of mathematics teaching at the elementary level is not only to instill basic mathematical knowledge but also to foster students' logical and analytical thinking skills, encourage thematic and creative thinking, and cultivate a collaborative problem-solving mindset, as articulated by Aisyah, Nyimas, and their colleagues in 2007.

Conceptual Understanding

Purwanto, as quoted in Murizal (202:19), articulates the idea that comprehension represents a certain level of cognitive ability that anticipates that a student is able to understand the meaning, concepts, situations, or factual information that they have previously encountered or learned. In line with this perspective, Suharsimi (2009) elaborates that comprehension encompasses a multifaceted process that includes the skills of distinguishing between various ideas, making assumptions, expanding existing knowledge, drawing conclusions, providing illustrative examples, rewriting information in one's own words, and estimating or approximating values or concepts.

A concept, as defined by Wardhani (2008:9), can be understood as an abstract idea that individuals use or utilize to categorize and organize various objects into coherent groups or classifications. In addition, mathematical concepts include a variety of concrete ideas, unique characteristics, basic principles, and the core content of mathematics as articulated by Budiono (in Gusniwati, 2015:28), highlighting the importance of these concepts in the field of mathematics education.

Conceptual understanding is indeed an important cognitive skill, as it involves the ability to identify and articulate abstract ideas in the realm of mathematics, which in turn enables individuals to classify objects that are usually represented in terminological expressions, and then translate these expressions into practical examples. This process not only facilitates a deeper understanding of mathematical concepts but also enhances learners' ability to understand and articulate these concepts in a meaningful, clear, and effective manner.

Comparison

In mathematics, the process of evaluating and comparing various materials alongside their respective applications can effectively serve as a method for analyzing and comparing two or more different objects, then enabling the calculation of their respective values through the use of highly precise mathematical formulas and methodologies. The concept of comparison, often referred to as ratio, represents a mathematical expression that facilitates the examination and comparison of two or more numerical values, thereby enabling a comprehensive understanding of their relationship. This mathematical principle can be effectively used to assess specific angles or dimensions to ascertain the current proportion relative to the total number of samples or elements involved in a given scenario. The comparative challenges that individuals often face during their mathematics education typically cover a range of topics, including but not limited to, comparisons of age, number of objects, variations in height and weight, and academic performance or grades in specific subjects.

Essentially, comparisons can be categorized into two main types, referred to as single-value comparisons—where the values are equal or fixed—and binary value comparisons—where values can be fixed and sometimes exhibit similar characteristics. One of the most significant advantages offered by the study of comparative materials is the inherent application of the concepts involved in practical situations encountered in everyday life. For example, one can determine a person's age if comparative data, such as quantity or differences related to other objects, is known; similarly, one can ascertain the proportions of ingredients needed for culinary purposes or evaluate the distance separating two different locations, such as city A and city B.

PAPER Media (Comparison Board)

The concept of media in the context of teaching and learning is often understood and interpreted as a series of graphic, photographic, or electronic tools specifically designed for the purpose of capturing, processing, and reorganizing visual and verbal information in a way that enhances the educational experience (Arsyad, 2011:3). In the academic discourse provided by authors Rossi and Breidle, as quoted by Vienna Sanjaya, it is stated that learning media includes all tools and materials that can be used for educational purposes, which may include, but are not limited to, radio, television, books, newspapers, magazines, and various other forms of media (Sanjaya, 2012:58).

Based on empirical research conducted by Sukarni, Hery Kresnadi, and Mastar Asran in 2015, as documented in Volume 4, Number 12 of their publication, it was revealed that the application of mathematics learning through the use of concrete media showed a significant increase with each successive teaching cycle. In an effort to capture and maintain students' attention and interest, the researchers took the initiative to develop a special educational tool called MEDIA PAPER, or Comparison Board, which serves as an innovative learning medium.

MEDIA PAPER, or Comparison Board, is a carefully crafted supplementary educational tool designed to help students overcome and solve real-world problems involving comparative analysis, with the hope that by engaging with this special learning medium, students will experience a more enjoyable and enriching learning process. This innovative approach is in line with the perspective offered by Shaiful Bahri Djamarah and Azwan Zain, who articulate that learning media functions as a supporting tool, acting as a channel through which educational goals can be communicated and achieved effectively (210:121). Consequently, what follows is a detailed draft outlining the innovative work related to MEDIA PAPER that has been carefully developed to support educational efforts.

Implementation of Observation and Results



On October 1, 2024, a dedicated team of researchers conducted carefully planned direct observations at the Nurul Iman landfill, where they focused their study on a specific demographic group, namely children living in the area, especially those in grades 4 to 6, comprising a total of about 20 individuals.

To facilitate their research, the researchers began by presenting mathematical problems involving comparisons, using specific formulas to obtain solutions, and then switching to the use of PAPER as a medium, with the aim of assessing how this approach would affect students' interest and enthusiasm for mathematical concepts over time.

During the initial stage of the learning process, when the PAPER medium was first introduced to the students, there was a noticeable sense of curiosity among them, as they expressed a desire to learn more about what this medium was, its intended purpose, and the methods by which they could effectively engage with it. When the researchers provided detailed explanations about the various components of the PAPER medium and the processes involved in its use, the students showed a high level of enthusiasm and concentration, eagerly absorbing the information presented to them.

The researchers continued to provide illustrative examples of how to approach problem solving by first applying mathematical formulas, and only after this did they introduce the PAPER media, with the aim of observing subsequent changes in the level of interest and motivation among students as they engaged with the material. One specific example of a problem posed to students was as follows: "Fariska has a ratio of candy to chocolate represented as 2:3; given that the number of candies Fariska has is 6, what is the corresponding number of chocolates she has?"

- • Solution using a formula :
 - chocolate/candy x 6
 - $3/2 \times 6$
 - = 9
- • Settlement with PAPER media:
 1. The top box is for candy and the bottom box is for chocolate.
 2. Since the ratio of candy is 2, then the number of boxes used is also 2.
 3. It is known that the number of candies is 6 with a ratio of 2.
 4. Fill the 2 boxes with 6 candies evenly.
 5. After filling them, each box contains 3 candies.
 6. To find the number of chocolates with a ratio of 3, fill 3 bottom boxes with chocolates equal to the number of candies in each candy box, i.e., one box contains 3 candies.
 7. After filling, add up the contents of the 3 chocolate boxes, which is 9 chocolates.
 8. So, the number of chocolates Fariska has is 9.

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1. Some of the functions of PAPER media in mathematics learning include
2. Increasing interest and enthusiasm for learning mathematics
3. Attracting students' attention to study the material • Improving students' ability to understand and apply mathematical concepts

D. CONCLUSION

The process of acquiring knowledge in mathematics during the formative years of elementary education, especially when it comes to understanding comparative material, often encounters significant obstacles that hinder students' understanding of important concepts. Given these challenges, there is an urgent and pressing need for engaging and tangible learning resources that can effectively stimulate students' interest and improve their understanding of mathematical principles. The use of PAPER Media, also known as the Comparison Board, has proven to be a highly effective tool that serves to clarify and explain complex comparative material to young learners. The application of such media not only facilitates a deeper understanding of the subject matter among students but also significantly increases their motivation and active participation in the educational process, which is essential for successful learning outcomes. Therefore, it can be concluded that the incorporation of concrete learning media, such as PAPER tools, presents a viable and strategic solution to the challenges faced by students in understanding complex comparability concepts in mathematics. By offering a more interactive and visually stimulating approach to learning, these resources have the potential to transform the educational experience and foster a deeper understanding of

mathematical comparisons. Ultimately, the integration of innovative learning aids is essential to bridge gaps in understanding and ensure that students are well-equipped to navigate the complexities of mathematical concepts.

RECOMMENDATIONS

1. It is crucial that educators continuously engage in the exploration and advancement of innovative learning media, such as PAPER, which is specifically designed to facilitate students' understanding of abstract mathematical concepts that often appear daunting and complex.
2. In addition, the application of such learning media must be implemented with a consistent approach and seamlessly integrated with interactive teaching methodologies, ensuring that the educational experience is not only more engaging but also significantly more accessible to students as they strive to understand complex subject matter.
3. Furthermore, there is an urgent need for comprehensive research initiatives aimed at rigorously assessing the long-term effectiveness of various learning media, including PAPER, particularly within the framework of different mathematical disciplines taught at the elementary school level, as this information is crucial for informed decision-making in educational practice.
4. Furthermore, it is important to provide targeted professional development opportunities for educators, equipping them with the skills and knowledge necessary to maximize the use of diverse learning media in their classrooms, ultimately transforming the learning environment into one that is more effective and enjoyable for all students involved.

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