ALJABAR
Journal of Mathematics Education

Vol.1 No.1 September 2024 Hal.26-33
ISSN : xxxx-xxxx | *E-ISSN* : xxxx-xxxx
DOI : xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
https://journal.cerdasnusantara.org/index.php/aljabar

Article History
Submitted: 8 Agustus 2024
Accepted: 28 Agustus 2024
Published: 30 September 2024

UTILIZING LEARNING MEDIA IN APPLYING THE CONCEPT OF MATHEMATICAL OPERATIONS TO ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

Mathematical operations are the basis of various branches of science. This paper aims to provide an overview of the concept of mathematical operations, including addition, subtraction, multiplication, and division. This is the basis of all calculations and is very important to understand from an early age. Children learn how to combine numbers (addition), subtract one number from another (subtraction), repeat addition (multiplication), and divide a number into equal parts (division). These concepts are taught through various methods such as using concrete objects, pictures, and story problems. In essence, elementary school mathematical operations are basic skills that help children understand the concept of numbers and the relationships between numbers. With the increasing development of digital technology, mathematics education can be optimized through various applications and interactive media that support the learning process. This study identifies various technological tools, such as educational software, mobile applications, and e-learning platforms, that can improve students' understanding of basic mathematical concepts, such as addition, subtraction, multiplication, and division. Through an interactive and fun approach, students are expected to be more motivated and active in learning. The results of using this technology show an increase in student engagement, conceptual understanding, and learning outcomes. This article also provides recommendations for teachers in effectively integrating technology into mathematics teaching in the classroom.

***Keywords*: media, operational concepts, students**

A. INTRODUCTION

The discipline of mathematics has increasingly been perceived as an intimidating subject by a significant proportion of students, which undeniably contributes to the frequently observed phenomenon of subpar performance in mathematical assessments. When inquiries are posed to students regarding which subject they find most challenging to master and comprehend, a remarkably common response that arises is mathematics, signifying the widespread apprehension associated with this field of study.

At the very foundation of mathematics lies the intricate realm of mathematical operations, which represent fundamental concepts that establish the groundwork for all forms of calculations and modeling endeavors within the mathematical landscape. Essentially, these mathematical operations encompass the systematic manipulation of numbers or variables, adhering to well-defined rules and principles, all with the objective of yielding a specific and desired outcome. The foundational operations, which include addition, subtraction, multiplication, and division, are introduced at an early educational stage due to their critical importance as the building blocks for more advanced arithmetic concepts. Each of these operations possesses its own unique characteristics and governing rules, rendering them applicable to a diverse array of calculation formats and scenarios.

The fundamental mathematical operations, specifically addition, subtraction, multiplication, and division, are undeniably pivotal constructs within the broader

framework of mathematics education, particularly in the context of integer operations. The comprehensive mastery of these essential concepts serves as a robust foundation that facilitates a deeper and more nuanced understanding of mathematics as a whole. However, it is essential to acknowledge that students frequently encounter significant challenges when attempting to grasp and apply these integer operations, as these concepts may be perceived as abstract and complex, particularly for certain learners who struggle to visualize them.

Traditionally, the instruction surrounding integer operations has often followed a conventional model, characterized by teacher-centered pedagogical methods and the predominant reliance on textbooks as the primary educational resource. This particular instructional approach tends to constrain active participation from students and does not fully capitalize on the potential advantages of visual media, which could significantly enhance comprehension of mathematical concepts. Consequently, it becomes imperative to explore the development and implementation of more effective learning methodologies that actively engage students in the process of understanding and applying integer operations, thereby fostering a more interactive and enriching educational experience.

In the context of everyday life, the application of mathematical operations permeates a wide array of fields, encompassing domains such as financial accounting, data processing, and the resolution of scientific and technical challenges. With the relentless advancement of technology, mathematical operations have also emerged as central elements within numerous computational algorithms, computer programming languages, and artificial intelligence systems, all of which hold critical importance in the contemporary world. Therefore, possessing a profound understanding of mathematical operations is essential, not only for success in formal educational settings but also for their practical application across various fields of study and professional disciplines.

The introductory arithmetic operations that are typically presented to students are addition and subtraction, which serve as the foundational elements upon which all subsequent arithmetic operations are built, given that both multiplication and division fundamentally rely on the principles of addition and subtraction. In the context of multiplication, this operation can be interpreted through the lens of repeated addition, where the same number is added to itself multiple times to arrive at a final product. For instance, the multiplication operation represented as 2 x 5 can be understood as the sum of the number 2 added together five times, thus yielding a total of 10, which can be mathematically expressed as 2 + 2 + 2 + 2 + 2 = 10. This example effectively illustrates the intrinsic connection between multiplication and addition, highlighting how the former fundamentally relies on the latter. In a similar vein, division can be conceptualized through the process of repeated subtraction, where a specific number is continuously subtracted by the same digit until the resultant value reaches zero (0). For example, in the division operation expressed as 10 : 2, the process entails subtracting the number 2 from 10 repeatedly until the outcome is zero, and the final count of how many times the number 2 is subtracted from 10 yields the answer of 5, as demonstrated through the calculation 10 - 2 - 2 - 2 - 2 - 2 = 0. This illustrates the principle that division can indeed be understood

through the operation of subtraction, reinforcing the interconnectedness of these fundamental mathematical concepts.

B. RESEARCH METHOD

The methodological approach employed in the formulation of this scholarly article is categorized as the library research method, which is intrinsically aligned with the qualitative research paradigm. As elucidated by Rosyidhana (2014: 3) in the work of Rusmawan (2019:104), the process of literature study constitutes a systematic method of gathering data that involves the meticulous search for and comprehensive reading of pre-existing written sources, which encompass a variety of texts such as books or academic literature that elucidate the theoretical underpinnings pertinent to the subject matter. In a similar vein, the task of data and information collection necessitates the thorough excavation of knowledge or scientific insights from diverse sources, including but not limited to books, scholarly writings, peer-reviewed journals, and an array of other resources that are directly relevant to the research object under investigation, as noted by Dewi in the analysis presented by Rusmawan (2019:104).

The methodological framework that guides this empirical study is identified as descriptive qualitative research, which emphasizes the richness of data in capturing the nuances of the subject matter being explored. The technique employed for data collection is characterized by triangulation, a robust method that integrates multiple existing data sources to enhance the comprehensiveness and reliability of the findings. The dataset utilized in this inquiry encompasses detailed descriptions pertaining to Proper Fractions, Decimal Fractions, Mixed Fractions, and Percentages, along with the various operational methodologies associated with these mathematical concepts as they are taught within the context of Elementary School education. The research instruments employed in this investigation include the authoritative text titled "Pengambangan Pembelajaran Matematika SD," authored by Atiaturrahmaniah, Doni Septu Marsa Ibrahim, and Musabihatul Kudsiah, in addition to the curriculum guide provided for fourth-grade Mathematics educators and a self-study module designed for independent learning purposes.

C. RESULTS AND DISCUSSION

Mathematical operations represent fundamental processes that are utilized for conducting various calculations across different fields of study. The realm of arithmetic operations serves as the foundational pillar upon which the entirety of mathematics is constructed and developed. Within this mathematical framework, one can identify four primary arithmetic operations that are essential for numerical manipulation and include, in a comprehensive manner, the actions of addition, subtraction, multiplication, and division. Additionally, it is pertinent to acknowledge that there exists a wide array of mathematical operations, which encompass various methodologies and techniques for solving problems and analyzing quantitative data, thereby enriching the discipline of mathematics as a whole.

1. Addition constitutes a fundamental mathematical operation that entails the process of aggregating two or more numerical values in order to derive a resultant figure

known as the sum or total. This specific operation is recognized as one of the cornerstone concepts within the realm of mathematics and finds application in a myriad of contexts encountered in daily life. Moreover, the numerical values designated for the addition process are referred to as "terms" or "addends," which play a crucial role in the operation. The amalgamation of these terms is denoted by the utilization of the plus sign (+). For instance, in a rudimentary addition equation such as 2 + 3 = 5, the figures 2 and 3 represent the terms that are being amalgamated to yield the resultant value of 5. Furthermore, it is noteworthy that when one adds the number 0 (zero) to any other numerical value, the outcome remains unchanged and equals that same number; for illustration, 15 + 0 = 15, demonstrating this principle effectively.

2. Subtraction is a fundamental mathematical operation that engages in the process of removing one numerical value from another to arrive at a result known as the difference. This particular operation stands in stark contrast to addition, serving as its inverse, and is regarded as an essential concept within the broader field of mathematics. In the practice of subtraction, three critical components must be acknowledged, namely the "minuend," "subtrahend," and "difference." The minuend represents the original number that is subjected to the operation of subtraction, while the subtrahend denotes the quantity that is being deducted from the minuend. The outcome of this operation is referred to as the difference, which is the final result obtained. The representation of the subtraction operation is achieved through the use of the minus sign (-). To illustrate this concept further, consider a straightforward subtraction example such as 5 - 2 = 3, wherein the number 5 functions as the minuend, the number 2 acts as the subtrahend, and the resulting value of 3 is identified as the difference.
3. Multiplication fundamentally represents the process of repetitively adding a specific numerical value a certain number of times. Specifically, as the act of addition can become rather laborious when conducted multiple times, multiplication serves as a more efficient method by allowing one to express the repeated addition of a number in a more succinct form. For example, the repetitive addition of 4 can be expressed as 4 + 4 + 4 + 4 + 4 = 20, indicating that we are effectively summing the number 4 to itself a total of five times. To streamline this somewhat tedious procedure, one can instead articulate it as 4 x 5 = 20, thereby encapsulating the entire operation succinctly. This process is formally recognized as Multiplication and is denoted by the cross symbol (x). Consequently, it is appropriate to assert that Multiplication can be conceptualized as Repeated Addition. To achieve proficiency and confidence in performing multiplication calculations, it is imperative for individuals to commit the multiplication table to memory with diligence and care. Within the scope of multiplication, there are three integral terms that come into play, specifically the Multiplier, the Multiplicand, and the Product, all of which warrant thorough examination and understanding.
4. The process of division can be defined as a fundamental mathematical operation that entails the action of partitioning a specific number into multiple equal segments or, alternatively, allocating a quantity into discrete groups that each contain an identical amount. This particular operation proves to be exceedingly advantageous when one seeks to effectively divide or partition a given quantity into equal components or segments. Within the realm of division, there exist several critical elements that play pivotal roles, namely, "the number that is to be divided" which is referred to as the dividend, "the number that acts as the divisor" which is properly termed the divisor,

> "the resultant number of equal groups or parts" known as the quotient, and "the number that remains after the division has been executed" which is called the remainder. The dividend represents the original number that is subjected to the division process prior to any calculations taking place, while the divisor is the numerical value that performs the action of dividing the initial number into smaller portions, and the quotient signifies the resultant quantity that indicates how many equal groups or segments have been successfully formed, with the remainder reflecting the leftover amount that has not been evenly distributed once the division is complete. The operations pertaining to division are commonly denoted using specific symbols, such as the division sign (÷) or the slash mark (/), both of which are universally recognized in mathematical notation. To illustrate this concept with a straightforward example, one might consider a basic division scenario like 10 ÷ 2 = 5 or 10/2 = 5, wherein the numeral 10 serves as the dividend, the numeral 2 functions as the divisor, and the resultant value of 5 is identified as the quotient. This example succinctly encapsulates the essence of the division operation and its components in a manner that is easily comprehensible. (Sa'dijah, 2004).

In the intricate process of acquiring knowledge concerning the various operations in mathematics, educators often utilize tangible educational tools, which take the form of a magic multiplication board, alongside digital resources such as PowerPoint presentations and interactive educational games like Educaplay. These tangible educational tools, which can be classified as concrete media, are physical entities that serve the crucial role of conveying or transmitting essential learning messages from instructors to their students, thereby fostering an environment that is conducive to and encourages the establishment of an enjoyable and stimulating learning process. Furthermore, the incorporation of concrete media into the educational framework is particularly effective in captivating students' interest, as these materials are meticulously designed to be as engaging as possible while closely resembling the actual objects they represent. This thoughtful design and presentation of concrete media serve to rekindle students' enthusiasm during the learning journey in mathematics, ultimately leading to a significant enhancement of their mathematical skills and competencies. Among the various concrete media employed in this educational endeavor, the magic multiplication board stands out as a particularly effective tool.

On the other hand, digital media represents a sophisticated amalgamation of numerous media types that are delivered in a digital format, encompassing an array of elements such as text, images, audio, video, and animations for educational objectives. This type of media is systematically designed to augment the effectiveness of the learning experience by facilitating interaction and engagement among students, thereby making the educational process more dynamic and immersive. The advantages offered by digital technology are being increasingly harnessed across various sectors, with education being one of the primary fields that significantly benefits from these advancements, particularly in terms of enhancing productivity and optimizing educational outcomes.

Educaplay, in particular, serves as a digital learning platform that empowers educators to design and disseminate a multitude of interactive activities in an online environment. The digital media that is grounded in the Educaplay framework includes a diverse range of

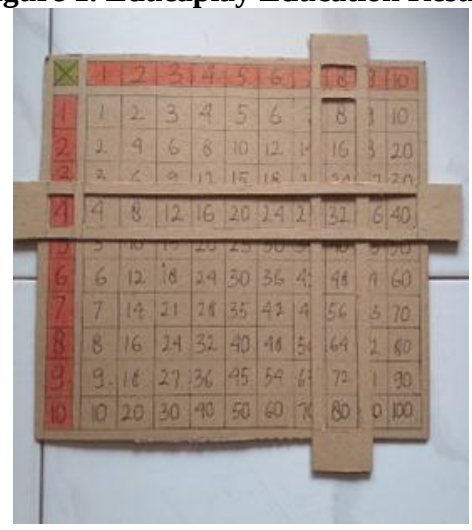
educational games and quizzes that are intentionally crafted to enrich and enhance the learning process for students. This innovative platform offers a plethora of tools that enable educators to create various forms of interactive activities, ranging from crossword puzzles and word games to multiple-choice quizzes, interactive videos, concept maps, fill-in-the-blank exercises, and an extensive array of additional resources. All of the activities generated through this platform can be meticulously customized to align with specific material needs and learning objectives.

In the context of the classroom, there exists a multitude of learning media that educators can effectively incorporate, one notable example being the utilization of Educaplay's digital media to significantly bolster students' comprehension in mathematics, particularly in relation to mathematical operations. The digital media provided by Educaplay is characterized by several notable advantages, including its engaging and interactive nature, which collectively serves as a robust solution aimed at fostering meaningful interactions between teaching and learning processes. This innovative media can effectively counteract the feelings of boredom, monotony, and fatigue that often plague traditional educational settings, while simultaneously stimulating students' curiosity and interest in the subject matter being presented to them.

The utilization of tangible and concrete media exemplified by the implementation of the Magic Multiplication Board, alongside the integration of digital media represented through the PowerPoint presentation software and the interactive educational game known as Educaplay, in the pedagogical process of imparting mathematical operations within the context of elementary education manifests in the following manner:

1. Concrete Media (Magic Multiplication Board)
2. Digital Media (Powerpoint dan Game Edukasi Educaplay)

Figure 1. Educaplay Education Results

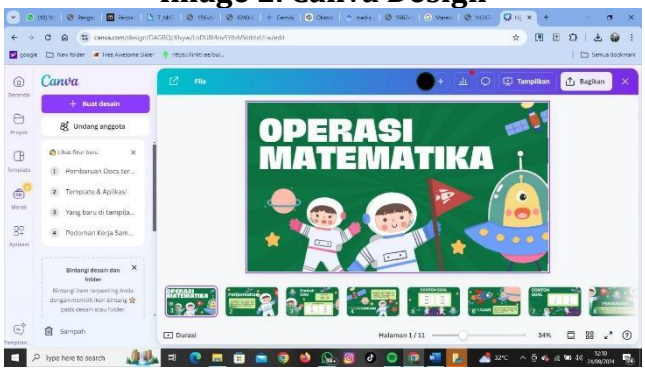


The incorporation of tangible educational materials in the realm of mathematics instruction, particularly concerning the intricate concept of multiplication, has been demonstrated to significantly bolster students' comprehension and grasp of this fundamental mathematical operation. Tangible educational materials, which can be described as physical objects that students are able to touch, manipulate, and engage with during their learning process, serve an essential role in facilitating a deeper understanding

of mathematical principles. By utilizing these hands-on materials, learners are afforded the opportunity to visualize and actively participate in the application of abstract ideas, such as multiplication, within contexts that mirror real-world scenarios. For instance, in the pedagogical endeavor of instructing students on the multiplication equation of 3 x 4, an educator might utilize a specially designed card that can be smoothly maneuvered towards the respective numbers of 3 and 4, thus providing a visual and tactile representation of the multiplication process. Consequently, students are able to tangibly witness the outcome within a designated area, which reinforces their understanding that multiplication fundamentally operates as a mechanism for repeated addition. This pedagogical strategy not only renders the educational experience more captivating and interactive but also serves as an effective means of addressing and alleviating the challenges that students often face when grappling with more abstract mathematical concepts. Furthermore, the integration of concrete educational materials into mathematics instruction can significantly elevate student engagement and motivation, fostering a richer and more meaningful learning experience that promotes deeper cognitive processing.

The KOPERAJA, which stands for Kotak Perkalian Ajaib, is an innovative acronym that translates to "Magic Multiplication Box," and represents an invaluable learning tool or medium that is crafted in the form of a cardboard box specifically designed for instructional purposes. This particular educational resource can be employed effectively during mathematics lessons, particularly focusing on the concept of multiplication (perkalian), allowing for a hands-on and engaging approach to learning this essential mathematical skill. Moreover, this medium proves to be particularly beneficial for students who may encounter difficulties in memorizing multiplication facts, thereby providing them with a supportive and interactive framework to enhance their understanding and retention of multiplication concepts. Through the strategic use of such innovative teaching aids, educators can create a more dynamic and supportive learning environment that caters to the diverse needs and learning styles of all students.

Image 2. Canva Design



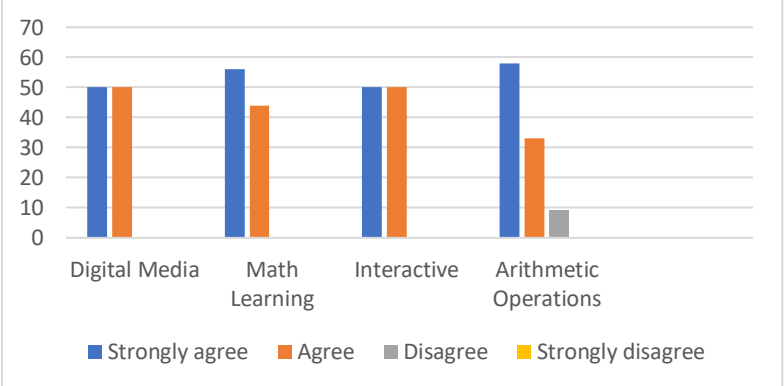
The utilization of advanced technological tools, specifically PowerPoint, can significantly enhance the pedagogical approach to teaching fundamental mathematical operations, which encompass addition, subtraction, multiplication, and division. Within the framework of the PowerPoint application, educators have the capacity to incorporate illustrative example problems that serve as practical illustrations, thereby facilitating a deeper comprehension of the material that has been previously articulated in the educational setting. This methodological integration not only aids in reinforcing the students' understanding but also promotes an interactive learning environment conducive to cognitive engagement and retention of mathematical concepts.

Figure 3. Mathematics Game Product

The implementation of the educational game known as Educaplay in the context of learning various mathematical operations serves as a methodological approach to evaluate the extent of students' competencies subsequent to the instructional content having been thoroughly presented through the use of PowerPoint presentations, which are designed to enhance understanding and retention of the material. Within the framework of this particular Educaplay application, we utilize an engaging and interactive quiz format featuring a jumping frog theme, which prompts students to engage with a series of questions that pertain to fundamental mathematical operations, including but not limited to addition, subtraction, multiplication, and division, thus fostering an immersive learning experience. During the activity, students are required to respond to a set of questions by selecting what they believe to be the correct answer from the options presented on the metaphorical Lotus Leaf, which serves as both a visual and functional element of the game.

In instances where the student's response is accurate, the frog character is depicted as surviving and remaining on the leaf, symbolizing the positive reinforcement of correct knowledge acquisition; conversely, if a student selects an incorrect answer, the narrative illustrates the unfortunate consequence of the frog sinking, thereby reinforcing the learning process through the consequences of incorrect responses. Following the completion of this engaging educational activity, the results of a satisfaction survey that was meticulously distributed among the participants yielded data that provides valuable insights into the overall effectiveness and reception of the game as a learning tool. The findings derived from this survey not only reflect the students' levels of engagement and enjoyment while participating in the game but also serve as a critical measure of the educational impact that such interactive methods can have on the learning of mathematical concepts. Ultimately, this approach to learning through gamification exemplifies the potential benefits of integrating technology and interactive platforms in educational settings, particularly in the domain of mathematics, where student motivation and comprehension are essential for academic success.

Table 1. Research Results



Upon careful examination and analysis of the diagram presented, it can be reasonably inferred that, on average, the majority of students exhibit a favorable disposition towards the utilization of digital media as a significant factor that contributes positively to enhancing their interest and engagement in the study of Mathematics; however, it is noteworthy to mention that there exist two specific indicators within the data that demonstrate a distinct equilibrium or balance between the responses categorized as strongly agree and those classified as simply agree.

D. CONCLUSION

In conclusion, it can be asserted that the comprehensive data gathered and meticulously detailed above concerning the pedagogical approach to teaching mathematical operations to elementary school children through the utilization of digital media, specifically involving the presentation of educational materials via PowerPoint on the Canva platform, in conjunction with interactive exercises utilizing the Educaplay application, as well as the incorporation of tangible learning media exemplified by the Ajaib game board, unequivocally indicates a trend of positive outcomes associated with the deployment of digital media; this is evidenced by the fact that, on average, a significant majority of students express their agreement that the integration of digital media notably enhances their engagement and enthusiasm for learning Mathematics. Nonetheless, it is important to highlight that there exist two specific indicators within the data that reflect a notable equilibrium between the response categories of strongly agree and agree, suggesting a nuanced perspective among certain students regarding the overall effectiveness of these digital tools in fostering their mathematical learning experience. Therefore, this intricate interplay between student responses underscores the necessity for ongoing research and analysis to better understand the diverse impacts of digital learning environments on elementary education, particularly in the realm of Mathematics, where varied levels of enthusiasm and engagement can significantly influence learning outcomes.

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