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Correlation of Memory Ability with Learning Outcomes Students at Elementary School

Ni'matul Izza[1], Wardah Tul Zanah[2], Putri Utami R[3], Ahmad Giri AM[4]
[1,2,3] Universitas Nahdlatul Ulama Indonesia
[4]Universitas Islam Negeri Sunan Ampel Surabaya, Indonesia

nimatulizza@unusia.ac.id

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ABSTRACT

This study aims to examine the correlation of students' memory skills to the mathematics learning outcomes of fourth grade students at SDN Jurumudi 4, Tangerang city. The method used is quantitative correlation. The data analysis technique uses a significance of 0.05 with a prerequisite test consisting of a normality test, linearity test, hypothesis testing (product moment person correlation and correlation coefficient significance test with the t test). The results of this study: (1) students' memory skills through descriptive statistical analysis found that there were 32 students in grade IV C at SDN Jurumudi 4 Tangerang city with an average memory score of 81.09 in the high category. (2) The learning outcomes of students in class IV C at SDN Jurumudi 4 Tangerang city in learning mathematics about fractional material equal to the number of students as many as 32 people with an average score of 76.31 in the high category. (3) The results of hypothesis testing through inferential statistics show that there is a correlation between students' memory skills and the mathematics learning outcomes of fourth-grade students at SDN Jurumudi 4, Tangerang City, with a correlation coefficient (r) of 0.429 and sig.0.014. It can be seen from the table of the level of correlation and the strength of the relationship. between the two variables is at the magnitude of 0.40-0.599 indicating that there is a moderate or sufficient correlation. Furthermore, to test the hypothesis using the correlation coefficient significance test with the t test and the results obtained are tcount > ttable (2.601 > 2.042) the hypothesis is accepted.

INTRODUCTION

In the field of education, the impact of internal factors like memory ability on learning achievement merits thorough investigation. Memory not only facilitates the retention and recall of information but is pivotal in determining academic success (Tyng et al., 2017; Pillado et al., 2020). According to Nofindra (2019), memory is an individual's ability to recall information stored in the brain, which is crucial for educational performance. This research aims to explore the significant relationship between students' memory capacities and their learning outcomes (Gagne & White, 1978; Du et al., 2022). Additionally, it will assess the integration of behaviorism and cognitivism, as suggested by Gagne, which posits that effective learning is a synthesis of both approaches (Pane & Dasopang, 2017). This aspect involves evaluating teaching methodologies that encompass both behavioral adjustments and cognitive enhancements. Furthermore, the study will delve into the biological processes of how the brain stores and retrieves various types of data—knowledge, events, and experiences—which are crucial for understanding how memory influences educational achievements. These focal areas highlight the need for a comprehensive examination of memory's role within educational activities, aiming to develop strategies that enhance cognitive abilities and

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thereby improve student learning outcomes (Chew & Cerbin, 2020; Idris et al., 2023).

Students have the ability to remember or memory with such a large capacity. Memory plays a very important role for students in the learning process. Memory is divided into three including sensory memory, short-term memory, and long-term memory (Nofindra, 2019). The difference between the three types of memory lies in the time when the stimulus occurs and reappears as output. Each student has a different memory. The memory ability possessed by each student can affect the learning outcomes achieved. Memory ability has the most important role in the learning process related to all subjects, especially learning mathematics. Mathematics is a science that produces various formulas and requires an understanding of concepts (Nelwan et al., 2021; Kliziene et al., 2022; Yunos et al., 2022). The formulas contained in mathematics material are formulas that are not only used for one lesson but the formulas are continuous with one topic to another, to be able to solve problems in mathematics students first remember the formulas and symbols in mathematics, this is the key to solving problems in mathematics. But the fact is that students have difficulty solving these problems due to a lack of understanding based on their ability to remember, especially in the material of fractions worth, the material of fractions worth sometimes makes students confused with the formula that will be used to solve these problems, therefore the role of memory is very important (Cowan, 2001; Leder & Forgasz, 2002). The sharper the student's memory, the more problems that are easily solved, so that the learning outcomes achieved are also getting better.

The primary objective of this research is to explore the correlation between the memory abilities of fourth-grade students and their academic outcomes at SDN Jurumudi 4 in Tangerang City. Specifically, the study aims to quantify the influence of memory on students' performance in mathematics, assess how distractions such as play activities impact memory, evaluate the effectiveness of teacher-initiated creative methods to enhance memory, and examine the role of lesson review in learning outcomes. This research offers significant theoretical benefits by providing empirical evidence on the importance of memory in the educational process, particularly in enhancing mathematical understanding (St Clair-Thompson & Botton, 2009; Xenofontos & Mouroutsou, 2022). It also aims to expand the literature on cognitive-based learning strategies. Practically, the study will guide teachers at SDN Jurumudi 4 and potentially other institutions on the benefits of adopting interactive and innovative teaching methods that improve memory retention. Additionally, it will aid in designing effective pedagogical techniques that address student concentration and memory issues, propose best practices for lesson reviews to boost information retention, and help formulate educational policies that enhance teaching and learning quality in relation to cognitive student abilities (Jamil et al., 2021; Shi & Qu, 2022).

In this study, we hypothesize that there is a significant positive correlation between memory ability and mathematics learning outcomes among fourth-grade students at SDN Jurumudi 4, Tangerang City. Additionally, we anticipate that distractions such as play activities negatively affect these students' memory capabilities. We also propose that creative teaching methods developed by teachers are likely to enhance the memory abilities of these students. Lastly, it is hypothesized that regular lesson reviews positively influence the learning outcomes by improving memory retention among the fourth-grade students at this school. These hypotheses will guide the research methodology and analysis to better understand the dynamics of memory in educational settings.

RESEACRH METHOD

This research adopts a non-experimental quantitative approach with a correlational design to investigate the relationship between two variables: memory ability (x) and learning outcomes (y). This methodology allows for the objective testing of theoretical hypotheses by examining the

interactions between these variables. As articulated by Creswell (2014), quantitative research typically involves hypothesis testing through the manipulation and measurement of variables, using statistical methods to analyze numerical data (Creswell, 2014). In this study, the variables of memory ability and learning outcomes are operationalized through specific indicators. These indicators are formulated into questions that constitute the research instrument used to collect data. The data obtained from this instrument is quantifiable, aligning with the fundamental attributes of quantitative research, where data must be numerical and amenable to statistical analysis.

For data analysis, this research utilizes IBM SPSS Statistics 24, a sophisticated statistical software that facilitates a range of quantitative analyses. This includes correlation analysis, which is central to understanding the degree and direction of the relationship between memory ability and learning outcomes. The use of SPSS helps in efficiently handling the data, conducting complex calculations, and providing reliable and valid results (Field, 2013). The setting of this study, SDN Jurumudi 4 in Tangerang City, provides a contextual background for the research, allowing for the examination of these variables within a specific educational environment. This situational context can help to illuminate unique insights into how memory ability influences learning outcomes in a real-world educational setting. By conducting this study in an actual school, the findings may provide practical implications for educational practices and policies at SDN Jurumudi 4 and potentially other similar institutions.

The population in this study were all students of SDN Jurumudi 4 Tangerang city with a total of 444 students. The sample taken was 32 students from grade 4 with the sampling technique used nonprobability sampling type Purposive sampling. The research instrument used was an essay test of 5 questions with a rubic 1-3 scoring system and a multiple choice test of 15 questions. The test has passed the validity test, reliability test, question difficulty test, and question differentiator test. The author presents the data from the test results of the test instrument as follows:

Table 1. Outcome Test Instrument Validation Results

Question item	r_{hitung}	r_{tabel}	Criteria
1.	0,330	0,279	Valid
2.	0,498	0,279	Valid
3.	0,149	0,279	Not Valid
4.	0,445	0,279	Valid
5.	0,420	0,279	Valid

Table 2. Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
,620	5

To accurately measure the impact of students' memory abilities on their mathematics learning outcomes, the research will employ a methodological approach that involves several stages of testing with the use of data collected from test instruments. Initially, these instruments will undergo pre-testing to ensure their validity and reliability. According to Allen and Yen (1979), this phase includes evaluating the validity of the questions to confirm they accurately measure what they are intended to measure, and assessing their reliability to ensure consistent results across repeated trials. Furthermore, the difficulty level of the test questions will be analyzed to ascertain their appropriateness for the target student group (Kline, 2005). The distinguishing power of the questions will also be tested to determine how well they can differentiate between students of varying memory abilities and learning outcomes (Crocker and Algina, 1986). Additionally, the normality of the data distribution will be checked using the Kolmogorov-Smirnov test, and the

linearity of the relationship between memory abilities and learning outcomes will be assessed (Field, 2013).

Following the preliminary testing, the Pearson Product Moment correlation analysis will be conducted using SPSS to explore the existence of a relationship between students' memory abilities and their mathematics learning outcomes (Howell, 2012). This analysis will help determine the direction (positive or negative) and the magnitude of the correlation coefficient between the two variables. Finally, hypothesis testing will be performed using the t-test for significance testing of the correlation coefficients at a significance level of 0.05 (Cohen et al., 2003). This will confirm whether the observed relationship is statistically significant, thus providing empirical support for the initial hypotheses of the study. This comprehensive testing and analysis process will ensure the study's findings are robust and reliable, offering valuable insights into the impact of memory on educational outcomes.

RESULT AND DISCUSSION

Memory Ability of Grade IV Students at SDN Jurumudi 4 Tangerang City

From the results of observations and interviews with the homeroom teacher of class IV at the school, problems were found that hampered students in achieving much better success. these problems are related to the memory ability of students who are still relatively low, it is known from the results of interviews that the school has not implemented learning related to memory development. Apart from these factors, this can also arise from within the students themselves, such as playing a lot and not reviewing the material at home. A person's memory ability cannot be equalized, because every human being has a different memory function and has a very large amount of memory, but due to various factors, not everyone can use this capacity to the fullest. Memory is an ability that individuals have to restore what information is taken and stored in the brain (Nofindra, 2019) argues that memory as a very important element of cognitive function has a strategic role in the process of independence in a person. Makhfudin (Mones, 2020) formulates memory indicators including remembering, capturing information, reciting, and memorizing. A person must go through several stages to be able to remember something and to be able to bring it up again.

The stages are as follows namely learning (entering), retention (storing), re-evoking, this relates to re-evoking something in memory (Saleh, 2018). Memory can be divided into three: sensory memory, short-term memory, and long-term memory, Long term memory or long-term memory is divided into three including (Suralaga, 2021). Declarative knowledge (memorized knowledge or meaningful knowledge), Procedural knowledge (knowledge of a certain procedure), Episode knowledge (knowledge related to time, place, autobiography, events). The memory ability of students can be influenced by two factors including internal factors and external factors. It may happen that each person has a different ability to remember and the nature of memory that each person has is not the same. The nature of memory (memory power) is divided into 4 types including (Warsah & Daheri, 2021): a) Simple and fast memory, this kind of memory that a person has makes it quick and easy to store or memorize an impression. b) Broad and reliable memory, individuals who have memories like this, people with memories like this can get a lot of impressions as well as such a wide scope. c) Faithful memory or memory, in this memory the impression (effect) that has been received remains intact when receiving it. d) Obedient memory, in this memory the impression that has been recorded and stored will be reproduced more quickly. Of the various characteristics of memory, each individual does not have the same nature of memory between one individual and another.

The results showed that the descriptive memory ability of fourth grade students at SDN Jurumudi 4 Tangerang city had been carried out according to the procedures in the study. The results of the descriptive analysis of memory ability have been obtained as follows:

Table 3. Descriptive Output of Memory Ability Data

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Daya Ingat	32	33	93	81,09	14,407
Valid N (listwise)	32				

Source: Results of Data Processing with SPSS IBM 24

Based on the descriptive output table of memory ability data, it can be seen that the maximum value is 93 with a minimum value of 33 with an average value of 81.09 with a std. deviation of 14.407. Elementary school age is a phase where children have entered the concrete operational phase. In concrete operational cognitive children experience rapid development. Being in normal circumstances, the ability of children in elementary school age to develop in stages (Marinda, 2020). Students can use their wits well, including in their memory ability. After knowing the minimum value, maximum value, and average value of memory ability, then the data categorization of the memory ability variable is carried out. Before determining the category of the assessment, first calculate the range (R), number of interval classes (K), and class length (p), including:

a) Range (R) = skor max-min
= 93-33
= 60

b) Number of Interval Classes (K) = 1 + 3,3 log n
= 1 + 3,3 log 32
= 1 + 3,3 (1,505)
= 5,9665 rounded to 6

c) Interval Class Length (p) = Range: Number of interval classes
= 60 : 6
= 10

Then after obtaining the range value (R), many classes (K), and class length (p) of the student memory ability variable can be categorized as follows (Sri Wahyuning, 2021):

Table 4. Category of Memory Ability Assessment Score

No.	Class Interval	Categories
1.	33-42	Very Low
2.	43-52	Low
3.	53-62	moderately
4.	63-72	very sufficient
5.	73-82	High
6.	83-93	Very High

The calculation of the average memory ability score for the fourth-grade students of SDN Jurumudi 4, Tangerang City, stands at 81.09. This score falls within the interval range of 73-82, which categorizes the memory ability of these students as high. This high classification is derived from written tests designed to sharpen and assess students' memory retention capabilities. The tests specifically measure how quickly and accurately students can recall information they have previously learned. The data obtained from these assessments indicate that the students possess a relatively rapid ability to retrieve memories of information. This suggests that the average memory ability among these students is in a good condition. Such a capability is crucial because memory plays a pivotal role in educational success. The ability to remember and recall information

efficiently is foundational for learning new concepts, solving problems, and performing well on assessments, all of which are integral to academic success. Furthermore, a high memory ability facilitates a deeper understanding of subjects by enabling students to build on existing knowledge without the continual need to relearn foundational concepts. This efficiency in learning and memory recall supports higher academic achievement and can significantly influence a student's educational trajectory. The findings thus underscore the importance of memory skills in the educational setting and highlight the need for educational strategies that support and enhance memory development among students.

Learning Outcomes of Fourth Grade Students of SDN Jurumudi 4 Tangerang City

According to Rusman, these learning outcomes (Fauhah, 2021), is a variety of experiences obtained by students covering cognitive, affective, and psychomotor. In addition, the definition of learning outcomes according to Febryananda (Fauhah, 2021), that is, the mastery or dominance that students have acquired after students absorb learning experiences. Learning is the main spear in educational endeavors. Without learning, education will not be born in the world. Learning as a process and learning is also a broad container in various fields of science in education. Change is the meaning contained in learning. Therefore, changes that occur in individuals are the result of learning. as for the indicators of learning outcomes put forward by Moore (Fauhah, 2021), There are three aspects, namely: cognitive, affective, and psychomotor. However, the author is more focused on the cognitive aspect.

According to Henry, as discussed by Hapnita et al., (2017), individual differences significantly influence learning and memory retention, highlighting four key areas: intelligence, cognitive styles, learning strategies, and memory ability. Intelligence varies widely among individuals, affecting their ability to grasp complex concepts and apply them across different scenarios. Cognitive styles describe how people perceive, process, and remember information, which can differ dramatically between individuals, such as some excelling in visual memory and others in auditory or abstract reasoning (Kozhevnikov et al., 2014; Hu et al., 2021). Learning strategies, which vary from person to person, include techniques like mnemonic devices, rehearsal, summarization, or conceptual mapping, each with varying levels of effectiveness depending on the individual. Memory ability, central to the learning process, also varies greatly and directly impacts academic performance and the capacity to build on existing knowledge. These inherent differences among individuals are significant as they dictate the efficiency with which information is absorbed and retained, underscoring the importance of recognizing and addressing these variations to optimize educational outcomes. Tailoring teaching methods to accommodate these diverse learning needs can significantly enhance educational effectiveness and help every student achieve their potential.

Student learning outcomes, particularly in the domain of mathematics, are influenced by a combination of internal and external factors. Mathematics is recognized for its profound capacity to teach critical skills and attitudes necessary for intelligent living and organizing various aspects of the world, as Hasratuddin in (2014). The mastery of mathematics equips individuals with the ability to understand and manipulate their environments effectively. The understanding of mathematics can be categorized into two distinct types, as identified (Novitasari et al., 2015). The first type, instrumental understanding, involves students memorizing mathematical formulas and applying them algorithmically to solve problems. This level of understanding is somewhat limited as students are typically unable to apply the learned formulas to new or unstructured situations that deviate from their training.

The second type, relational understanding, represents a deeper level of comprehension. Students with relational understanding do not merely memorize and use formulas; they also grasp the underlying concepts, allowing them to apply their knowledge to solve problems in varied contexts beyond the original scenarios for which the formulas were taught (Woolley, 2011; Demetriou et al., 2022). This type of understanding enables students to integrate their mathematical knowledge flexibly and creatively across different situations, reflecting a more comprehensive and

adaptive form of learning. Understanding these two types of mathematical comprehension is crucial for educators aiming to enhance mathematical learning. Emphasizing relational understanding in educational practices can lead to more robust and adaptable knowledge among students, better preparing them for real-world applications of mathematics..

For learning outcome variables obtained from written tests in the form of multiple choice with an assessment range of 1-100. Data on learning outcomes obtained from 32 students were analyzed using descriptive statistics with the results of descriptive statistical output of mathematics learning outcomes worth fractions as follows:

Table 5. Learning Outcome Data Descriptive Output

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Learning Outcomes	32	26	100	76,31	18,564
Valid N (listwise)	32				

Source: Results of Data Processing with SPSS IBM 24

From the results of descriptive analysis of learning outcomes data, the maximum value is 100 with a minimum value of 26 with a mean of 76.31 with a Std. Deviation of 18.564. After knowing the mean value of learning outcomes, the categorization of the learning outcomes variable is then carried out. Before determining the category of the average value, first calculate the range (R), many interval classes (K), and class length (p) as follows:

a) Range (R) = max – min Score
= 100 – 26
= 74

b) Number of interval classes (K) = 1 + 3,3 log n
= 1 + 3,3 log 32
= 1 + 3,3 (1,505)
= 1 + 4,9665
= 5,9665 Rounded to 6

c) Interval class length (p) = Range : Number of interval classes
= 74 : 6
= 12,3333 Rounded to 12

Then after obtaining the range value (R), many classes (K), and the length of the interval class (p) of the learning outcomes can be categorized as follows (Wahyuning, 2021):

Table 6. Category of Learning Outcome Assessment Score

No.	Class Interval	Categories
1.	26-37	Very Low
2.	38-49	Low
3.	50-61	moderately
4.	62-74	very sufficient
5.	75-87	High
6.	88-100	Very High

Based on the average score of 76.31 for mathematics learning outcomes, specifically in the area of fractions, the students of class IV C at SDN Jurumudi 4 in Tangerang City have demonstrated high achievement. This score categorizes their performance as being in the upper

echelon, indicating that the students not only understand the material but are also able to apply their knowledge effectively in assessments. Learning outcomes serve as a crucial metric for evaluating student achievement in educational settings. They reflect the culmination of various educational inputs and processes, including teaching methods, student engagement, and curriculum effectiveness. The high scores achieved by the students suggest that these factors are being effectively managed within class IV C, resulting in strong academic performance.

Furthermore, the relationship between memory ability and learning outcomes is significant and inseparable. Memory plays a foundational role in how students absorb, retain, and retrieve knowledge. Strong memory skills enhance the ability to recall mathematical formulas and concepts, which is critical in subjects like mathematics where cumulative knowledge builds upon itself. Therefore, students with higher memory capabilities tend to perform better academically, as they can more readily access the information needed to solve complex problems and understand new concepts. The achievement of the students in class IV C indicates not just a momentary grasp of fractional mathematics but suggests a more profound comprehension that could likely be attributed to robust memory skills among other factors. Recognizing this link is essential for educators as it underscores the importance of supporting memory development alongside traditional teaching methods to boost overall learning outcomes.

Correlation of Students' Memory Ability with Grade IV Mathematics Learning Outcomes at SDN Jurumudi 4 Tangerang City

Testing in this study uses product moment person correlation. The product moment person correlation aims to determine the relationship and state the magnitude of the relationship between variables. This study uses product moment person correlation because there are only two variables, namely variable X (memory) and variable Y (learning outcomes). Furthermore, to determine the hypothesis in this study, the authors tested the significance of the correlation coefficient with the t test at the significance level = 0.05. The following is the formulation of the hypothesis in this study, namely:

H_0 : There is no correlation between students' memory ability and fourth grade mathematics learning outcomes at SDN Jurumudi 4, Tangerang city..

H_a : There is a correlation between students' memory ability and the learning outcomes of fourth grade mathematics at SDN Jurumudi 4, Tangerang City..

Test the correlation analysis of product moment person by comparing the significance (sig) probability of 0.05 or comparing r_{hitung} with r_{tabel}. If the significance <0.05 there is a relationship between variables, but on the contrary, if the significance> 0.05, it is stated that there is no relationship between variables. And if $r_{hitung} > r_{tabel}$ then there is a relationship between the two variables. If $r_{hitung} < r_{tabel}$ it is stated that there is no relationship between variables. In this study, researchers used the IBM 24 SPSS program for testing product moment correlation analysis. The results of the product moment correlation analysis can be seen from the following table:

Tabel 7.*Output Correlations Product Moment*

Correlations			
		Memory	Learning outcomes
Memory	Pearson Correlation	1	,429*
	Sig. (2-tailed)		0,014
	N	32	32
Learning outcomes	Pearson Correlation	,429*	1
	Sig. (2-tailed)	0,014	
	N	32	32
*. Correlation is significant at the 0.05 level (2-tailed).			

Source: Results of Data Processing with SPSS IBM 24

From the Product Moment Correlations Output, it can be seen that the significance value is 0.014 <0.05, and r_{hitung} 0,429 > r_{tabel} 0,349. Furthermore, to see how much or the strength of the relationship between the memory ability variable and the learning outcome variable, it can be seen from the table below (Machali, 2017):

Table 8. Correlation Level and Relationship Strength

No.	Correlation Score (r)	Relationship Level
1.	(+/-) 0,00 – 0,199	Very Low
2.	(+/-) 0,20 – 0,399	Low
3.	(+/-) 0,40 – 0,599	moderately
4.	(+/-) 0,60 – 0,799	Srong
5.	(+/-) 0,80 – 1,000	Very Strong

The correlation between students' memory ability and their learning outcomes in grade IV math at SDN Jurumudi 4, Tangerang City, has been quantitatively analyzed, revealing a correlation coefficient of 0.429. This indicates a positive relationship between the two variables, suggesting that as a student's memory ability increases, so do their math learning outcomes, and conversely, lower memory ability is associated with lower learning outcomes. The correlation coefficient of 0.429 places the strength of this relationship in the moderate category. This moderate correlation highlights that while memory ability is an important factor influencing learning outcomes, it is not the sole determinant. Other factors might also play significant roles and should be considered in understanding the full scope of influences on academic performance. This relationship's moderate strength provides useful insights for educational strategies that could focus on enhancing memory skills as a way to potentially boost learning outcomes in mathematics.

Then hypothesis testing is carried out using the correlation coefficient significance test with the t test at the significance level = 0.05 with the following formula:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

$$t = \frac{0{,}429\sqrt{32-2}}{\sqrt{1-0{,}429^2}}$$

$$t = \frac{0{,}429\sqrt{30}}{\sqrt{1-0{,}184041}}$$

$$t = \frac{0{,}429\ .\ 5{,}477225575\,0}{\sqrt{0{,}815959}}$$

$$t = \frac{2{,}34972977}{0{,}9033044890}$$

$$t = 2{,}601$$

The results of the correlation coefficient significance test are then compared with the t table with a significance level of 5% and dk = n-2 = 32-2 = 30, then obtained t_{tabel} = 2,042, and from the results of the correlation coefficient significance test, the price of t_{hitung} = 2,601which means that the value of $t_{hitung} > t_{tabel}$ = 2,601 > 2,042, then H_0 rejected and H_a Accepted. The hypothesis in this study is accepted, which means that "There is a correlation between students' memory ability and fourth grade math learning outcomes at SDN Jurumudi 4, Tangerang city".

High memory ability will make it easier for students to understand lessons at school and there will be opportunities for students to achieve good learning outcomes as well. The more information

students get, the more often one information with other information is related to each other. In accordance with Sidiarto's opinion (Pratiwi, 2018). Memory is a crucial component of cognitive function, playing a strategic role in fostering individual independence by empowering individuals to break free from ignorance. According to Walgito's theory, memory is an integral part of the cognitive system, responsible for processing and storing information. This storage capability allows for the integration of new information with existing knowledge, facilitating the formation of ideas and the recall of experiences when necessary (Paas & Ayres, 2014; Schlichting & Preston, 2015; Sridhar et al., 2023).

The ability of memory to interlink various pieces of information is essential for learning. As students encounter new data, their memory helps to connect this data with already stored knowledge, creating a richer, more interconnected cognitive map. This process is vital for learning outcomes because it enables students to apply learned concepts to new situations, enhancing their problem-solving skills and academic performance (Gleason et al., 2011; Almulla, 2023). Moreover, the frequency and consistency with which students can connect new information to existing knowledge significantly impact their ability to remember and utilize this information effectively. Every piece of data that enters the memory system leaves a trace that becomes more accessible with repeated activation. This is particularly relevant in educational settings, where repeated exposure to and application of knowledge reinforce learning and memory retention (Chen & Yang, 2020; Walsh et al., 2023). Thus, the role of memory in the learning process extends beyond mere data storage. It involves actively connecting and reorganizing information, which not only supports learning but also aids in the synthesis of new ideas and the practical application of knowledge in various contexts. Enhancing memory capability can therefore significantly improve educational outcomes, providing students with the tools they need to succeed academically and achieve cognitive independence.

CONCLUSION

Based on the results of data analysis in research conducted by the author on grade IV students of SDN Jurumudi 4 Tangerang city, and referring to the formulation of the problem, it can be concluded that: 1) The memory ability of students in class IV C SDN Jurumudi 4 Tangerang city, with a sample size of 32 students, can be seen from the results of the memory ability test related to mathematics worth fractions has obtained the lowest score of 33, the highest score of 93, a mean of 81.09, and Std. Deviation of 14.407. So with the mean results of the memory ability of class IV C students classified as high, it can be concluded that class IV C students have relatively good memory ability. 2) The learning outcomes of students in class IV C SDN Jurumudi 4 Tangerang city, with a sample size of 32 students, can be seen from the learning outcomes test which covers cognitive aspects related to mathematics worth fractions, the lowest score is 26, the highest score is 100, the mean is 76.31, and the Std. Deviation of 18.564, with the mean value of the learning outcomes of class IV C students said to be classified as high, therefore it can be concluded that the learning outcomes achieved by class IV C students are in good condition. 3) Based on the results of the correlation analysis of students' memory ability on learning outcomes, it was obtained $r_{hitung} > r_{tabel}$ (0,429 > 0,349) dan significance 0.014 <0.05, then there is a positive correlation between memory ability and fourth grade math learning outcomes at SDN Jurumudi 4 Tangerang city with the magnitude or strength of the correlation classified as sufficient. The correlation between memory ability and learning outcomes is positive, which means that the memory ability possessed by each student will affect the learning outcomes they get. Then the results of this researcher's hypothesis testing in testing the significance of the correlation coefficient with the t test and the results obtained are as follows $t_{hitung} > t_{tabel}$ (2,601 > 2,042) the hypothesis is accepted. So, the higher the ability of students' memory, the higher the learning outcomes achieved. For readers or further

researchers, it can be used as reference material in further research. It is suggested that future researchers can develop research variables.

This research enriches the understanding of the relationship between memory ability and learning outcomes, particularly in mathematics, by providing empirical support for educational psychology theories that link cognitive capabilities with academic performance. The results underscore the importance of effective memory in grasping and applying mathematical concepts, which can inform more targeted teaching strategies aimed at enhancing memory retention through methods like mnemonic devices and activity-based learning. Furthermore, the findings advocate for early assessments and tailored interventions for students with lower memory abilities to bolster their academic achievements. Educators are encouraged to adapt their teaching methods to foster not only repetitive learning but also deep conceptual understanding. The insights from this study could also guide the development of teacher training programs that focus on cognitive skill enhancement, thereby improving educational practices and student outcomes in mathematics. Future research could expand on these findings by exploring the influence of external factors on the cognitive-learning relationship or by evaluating specific educational interventions.

Future research should consider broadening the scope to include a wider range of cognitive and non-cognitive variables, such as emotional intelligence and environmental factors, to explore their effects on academic performance more comprehensively. Longitudinal studies could track the long-term impacts of memory on learning, while research across diverse educational settings could help generalize findings and validate intervention effectiveness. Comparative studies might assess different teaching methodologies, such as problem-based learning versus traditional teaching, for their impact on memory and learning outcomes. Additionally, integrating neurological assessments could link cognitive psychology with neuroeducational research, providing deeper insights into the biological processes that underpin memory and learning. This approach would enhance understanding and inform more effective educational strategies.

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