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Correlation Study of Visual, Auditorial and Kinesthetic Learning Styles (VAK) with Mathematics Learning Outcomes for Elementary School Students

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Abstract: This study aims to analyze the correlation between VAK learning styles and mathematics learning outcomes in elementary school students. Quantitative correlation was a research method used with an ex post facto design. Non Probability Sampling is a technique used in sampling. This research instrument used tests, documentation and questionnaires, interviews as complementary techniques. To test the requirements of the analysis using the obtained regression equation and the Linearity Test. Then the regression linearity test was calculated and obtained F_{count} = 0.3943 and F_{table} = 2.40 so that it can be concluded that the data from the two variables is linear. The correlation between the two variables was he the study's results of 0.7153 while 0.361 with a significant level of = 0.05. Based on these results, > that was 0.7153 > 0.361, this proves that Ho is rejected and H1 , meaning that there is a significant correlation between visual, auditory and kinesthetic learning styles with mathematics learning outcomes in students. The interpretation of the coefficient is a high degree of correlation.

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Introduction

Education is one of the most important ways to inspire the future, because it is always guided by the willingness of students to play a role in the future. Learning is an attempt to acquire intelligence and knowledge. Learning is an ongoing effort for students to achieve success and change overall behavior. The learning success achieved was the learning process that was achieved as far as students absorb the material being taught (Hasibuan, 2019). Education is the main door that aims to improved the human personality with the potential developed by humans, and later give birth to humans with superior personalities and skills and learning abilities (Bire, 2014). Learning was an effort to acquire knowledge or skills through instruction with the environment (Fitria, Sholeh, Sulaswati, 2021). In other words, learning about personality was a change that occurred so that people could get used to themselves and understand attitudes, habits, intelligence, understanding processes, and skills in everyday life (Palapa, 2021). The skills that students gain from the learning experience are known as learning outcomes, so the goal of learning outcomes is that there is a change for themselves (Nisa et al., 2018). Students who do learning experience a process from not knowing to knowing, meaning that students are undergoing a process of change in themselves.

As part of primary school level education in the 2013 curriculum, lessons are presented using a thematic and integrated approach. Subjects that are learning content consisting of Pancasila and the general public, Indonesian language, science, social studies,

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physical education and mathematics. All lessons are arranged in books called thematic books, except for Islamic religious education, English, and regional languages (according to school policy). In the 2013 curriculum, students must have good knowledge, attitudes, and skills to increase productivity, creativity, and innovation. Especially low-grade learning in mathematics learning.

Basically, one subject must be understood by students, namely Mathematics (Oktavianingtyas, E., Salama et al., 2018). Mathematics should not only be taught formally in kindergarten, but also as a problem solver in everyday life. Learning mathematics itself requires activities and interactions between educators and students. According to Nana Sudjana in (Ahmad Susanto, 2016) Mathematics learning in elementary schools had a purpose, the objectives are:

1) In connection with this process, students are actively involved in a continuous physical, mental, and social learning process. Through these actions, they show a high enthusiasm for learning and can believe in themselves, so that the learning process is successful and quality.
2) In terms of outcomes, the learning process is effective when behavior changes for the better or more positive and the learning objectives set are achieved.

The learning process of mathematics does not always run effectively. Even mathematics learning is always considered very difficult, boring, and often considered a scary lesson, so mathematics has not become a subject in great demand by students, Mathematics is always considered difficult because the object of mathematics is abstract. use multiple expressions. Therefore, not all mathematics material is easily understood by students, and the views of mathematics students about teaching in schools are difficult to solve and complicated to apply and understand about what teachers teach.

Based on the results of observations and interviews at SDN Srengseng Sawah 04, learning mathematics has the following problems:

1) The learning process, especially for lower classes, still tends to be monotonous, as students listen, and the teacher explains.
2) Lack of practice math problems, thus making the knowledge and learning outcomes of mathematics low.
3) Lack of active involvement in the learning process of mathematics at school, so they have a lack of confidence to ask questions.

So, this is the KKM (Minimum Provision Criteria) score for mathematics subjects of 70, where only 10 students out of 32 students achieve the KKM, and 23 students do not reach the KKM. Based on the data and problems above, it is hoped that teachers can adjust students' learning styles to create an interesting and fun mathematics learning experience and instill a love for mathematics in their students. Learning styles were formed naturally according to the intelligence and potential of each individual (Cholifah, 2020). Basically, the learning styles possessed by students are different from one another (Salsabila, 2019). Students' learning style in the learning process can absorb the material they like. So that each student has a different effective learning method. In terms of learning styles, there were 3 types : Kinesthetic (motor sensation), visual and also auditory (listening) (Murwanto, 2020).

Ruseel (Saputra, R. B dan Arianto, 2019) stated the advantages and disadvantages of kinesthetic, visual and auditory which are learning styles, as follows : The advantages of kinesthetic, visual and auditory are the three learning styles can be combined so that they become more effective, train and develop their potential, provide a direct experience so that

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the learning environment becomes more effective, good and also interesting. Through physical activity, students can find and understand a concept maximally that involves students. The difficulty of kinesthetic, visual, and auditory is combining the three learning styles. It is because not everyone can do it; they must prepare all the requirements carefully, which usually takes much time, and students must play an active role in supporting the teacher by following relevant media and materials; the learning process VAK will run well if there are media that are linked according to the topics discussed following the three events (Qomarudin, 2021).

Learning styles were the various ways students collaborate with other students in learning at school, including collecting, organizing, and processing the information they received to help them learn effectively (Jumroidah, Siti Kadir, 2018). Learning styles are related to how students prefer to learn not what they learn. Different learning styles could encourage them to develop the style they liked (Nastiti & Wahyu Rika Agustin, 2021). The VAK (Visual, Auditory and Kinesthetic) Learning Style Model in the learning process combines three learning styles (Kinesthetic, Visual, Auditory) into one learning model, namely:

1) Visual learning style is a learning method that uses sight more. This is because it can be seen by imagining activity as an expression of the information that has been absorbed, which it will definitely have. Moreover, it had strong colour sensitivity and good understanding (Wahyuni, 2017).
2) Audiotorial learning style is learning very well in terms of oral activities, auditory style learners learn through good listening and speaking and auditory learning style It can tell the story well, but it is difficult to write. They learnt by reading aloud (Hamzah B. Uno, 2016).
3) Kinesthetic learning styles are speaking or verbal activities. The speaking activities in question include, asking questions, memorizing material and discussing with friends. Students with kinesthetic tendencies would become speakers, because speaking was a form of movement (Siti riska amina & Zulkifii simatupang, 2021) They directly work, touch, move or learn.

The combination of the three learning styles encouraged students' understanding of the material (Noorbaiti et al, 2018). Learning styles allow students to directly experience visual, auditory, and motoric learning (VAK) and make learning fun (Safri andi muhamad, 2018). Based on this explanation, the purpose of this study is to analyze the correlation between VAK learning styles and mathematics learning outcomes for elementary school students. This research is important to do because in the learning process learning outcomes are important things to be used as instructions so that they can find out the extent of student success in learning activities that have been carried out.

Research Method

This research used correlation as a method, which is supported by a quantitative approach. This research design used ex pasto facto, a correlational method with research designs related to causality, which was directly examined so that during the process the researcher did, it could not be manipulated (Firman & Rahayu, 2020). The technique used in this research was *non-probability sampling.* Sampling selected as a sample can give each member of the population an equal opportunity. This is a technique to determine whether the

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sample is determined randomly if the object is a broad research object obtained by drawing lots to determine the class to be used (Arieska & Herdiani, 2018).

The research instrument used tests and questionnaires. According to Sugishirono (Darma, 2021) the formula used to test the validity of learning outcomes was *the biserial point correlation coefficient*. This expression is used for nominal variables with dichotomous variables or multi-choice ratios/intervals. On the other hand, the formula used to test the validity of a learning style is *the product moment*. If the question is valid, then the question is tested for accuracy used in learning through reliability testing using the KR-20 formula to determine student learning outcomes with answers "yes" or "no" to help researchers determine the reliability of research tests If yes, then value = 1 and no no value = 0. While the *alpha* used for the reliability test aims to be able to find a student learning style questionnaire (Firman & Rahayu, 2020). Data analysis technique used the normality test and the *Liliefor* to verify that the data in the sample was healthy. Then the *linearity* used as a predictor is linear. Alternatively the dependent variable relationship is not fixed with the simple regression equation equation formula (Safri andi muhamad, 2018). Then lastly, hypothesis testing using *person product moment correlation* was carried out to determine whether this research was relevant (Nainggolan et al., 2021).

Results and Discussion

The results of this research were in the form of data description, data analysis, and discussion. The instrument used in the study was a test that included a questionnaire. The test in student learning aims to get learning outcomes from students, and questionnaires in student learning aim to find out students' learning styles. Before using questions in research to test mathematics learning outcomes, researchers must use the *briserial point correlation* to test the validity of the questions. Previously, the researcher asked 40 multiple choice questions (PG) which consisted of four possible answers. The questions are scored if the correct answer tested in Class III B is 1 point for the correct answer and the wrong answer is 0. After doing the calculations, obtained 26 valid items that can be used as research tools. To test students' learning styles, researchers must use *product moment* as a formula to test the validity of the questionnaire. Initially, the researcher made 30 statement items with 4 answer choices and a score range of 1 to 4. That is, 4 = never, 3 = rarely, 2 = often, 1 = very often. Students tested in Class III B received 20 valid statement items after performing calculations. Can be used as a research tool.

Table 1. Classification of Test Items

Classification	Number of Questions	Question Number
Valid	26	1,2,3,4,6,7,8,10,12,13,17,20,21,22,23,24,25,26,29,30,32,33,36,38,39,40
invalid (Drop)	14	5,9,11,14,15,16,18,19,27,28,31,34,35,37

Questions that are already valid must be retested using the reliability test with the formula KR – 20. Because a good question must be reliable. With the calculation results, namely 0.945 > 0.70, it is concluded that the 26 items are reliable.

Table 2. Reliability Test Results

N	N	r_{hitung}	r_{tabel}	Conclusion

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26	32	0,945	0,70	$r_{hitung} > r_{tabel}$ The question is declared reliable

Table 3. Classification of Questionnaire Statement Items

Classification	Statement Items	Question Number
Valid	20	1,2,4,6,7,8,10,12,14,15,17,19,21,22,24,25,26,28,29,30
Invalid (Drop)	10	3,5,9,11,13,16,18,20,23,27

A valid questionnaire must be retested using a reliability test with the Alpha formula because a good questionnaire must be reliable. With the calculation results, namely 1.40 > 0.361, it is concluded that the 20 items of the statement are reliable.

Table 4. Reliability Test Results

N	N	r_{11}	r_{tabel}	Conclusion
20	32	1,04	0,361	$r_{11} > r_{tabel}$ The statement item is declared reliable

Supporting instruments in the form of data documentation are syllabus, lesson plans, student attendance, Student Worksheets (LKPD) and taking pictures or photos to strengthen evidence of research implementation.

Figure 1. The Process of Working on Problems

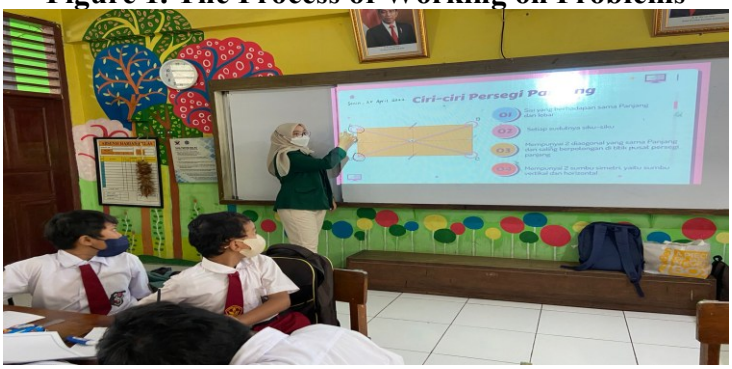

Figure 2. Researchers Provide Material

After doing research at SDN Srengseng Sawah 04 in class III, the data that had been obtained must be re-tested on testing requirements analysis. In order to get a normal population, the researchers used the Liliefors test as a formula for the normality test. The calculation of the normality test is as follows :

Table 5. Normality Test Criteria

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Group	L_{hitung}	L_{tabel}	Description
Math Learning Outcomes	-0,01055	0,157	Normally Distributed Data
Learning Style (VAK)	0,011	0,157	

From the above calculations, it can be concluded that the mathematics learning outcomes = -0.0105 and with a significant level of = 0.05 that is 0.157 while the student learning style = 0.011 and with a significant level of = 0.05 that is 0.157 . Ho is accepted and H1 so the students related to learning styles and learning outcomes of mathematics, both populations are normally distributed.

The next analysis requirement test is linearity test using a simple linear regression equation formula to find out whether two variables have a linear relationship or not significantly. Based on the calculation results, the values obtained a = 19.02 and b = 0.1898. So that the regression equation obtained is = 19.02 + 0.1898 x.

Table 6. Table of ANOVA

SV	ak	Jk	KT	FH	F tabel
Total	32	38093	38093	-	-
Regression (a)	1	37881,28	37881,28	-	-
Regression (b/h)	1	108,29	108,29	31,41	-
Residu	30	103,43	3,4476	-	-
Chopped Tuna	8	9,21	1,1512	0,3943	2,40

After calculating the linearity regression test, it is obtained = 0.3943 and = 2.40 so that it can be concluded that the data from the two variables is linear. Testing the requirements of the last analysis is using the *person product moment* as a correlation formula for hypothesis testing which aims to find out whether there is a relationship or not in this study. Here are the results:

$$r_{XY} = \frac{\sum XY - \frac{(\sum X)(\sum Y)}{N}}{\sqrt{(\sum X^2 - \frac{(\sum X)^2}{N})(\sum Y^2 - \frac{(\sum Y^2)}{N}}}$$

Is known :

$\sum x = 2593$ $\sum x^2 = 213119$
$\sum xy = 89786$ $\sum y^2 = 38093$
$\sum y = 1101$ N = 32

Solution :

$$r_{XY} = \frac{89786 - \frac{(2593)(1101)}{32}}{\sqrt{\left(213119 - \left(\frac{2593}{32}\right)^2\right)\left(38093 - \frac{(1101)^2}{32}\right)}}$$

$$= \frac{89786 - 89215{,}4063}{\sqrt{(213119 - 210114{,}031)(38093 - 37881{,}2813)}}$$

$$= \frac{570{,}6}{\sqrt{(3004{,}97)\,(211{,}72)}}$$

$$= \frac{570{,}6}{\sqrt{1008507478}}$$

$$= \frac{570{,}6}{797{,}63}$$

$$= 0{,}7153$$

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From the calculation of the hypothesis test obtained 0.7153 while the degree of freedom (dk) = 30 at a significant level = 0.05 of 0.361. Because and is known that is 0.7153 > 0.361.
Based on the test criteria:
then H_o accepted, meaning that there is no significant relationship.
then H_{is} rejected, meaning that there is a significant relationship.
Thus, from the results of the above calculations, it can be concluded that rejected, meaning that there is a significant relationship between visual, auditory, and kinesthetic learning styles with mathematics learning outcomes for Third-grade students at SDN Srengseng Sawah 04.

After implementing of the learning process with visual, audiotorial and kinesthetic learning stylesin class III students become more enthusiastic and actively ask questions in learning mathematics subjects. Because in the learning process in the classroom, students not only listen to explanations from the teacher, but students can be more active by conducting discussions with peers. With a learning style, students will be more motivated when he learns with their learning style. This means that in the learning process students play an active role in the process of listening, seeing, discussing, and doing what they get during the learning process.

When all processes have been carried out, students can master what they learn and quickly understand the materials provided by the teacher. So that the visual, audiotorial and kinesthetic learning styles in the circular shape material can be effective on the learning outcomes of third grade mathematics at SDN Srengseng Sawah 04. It can be seen that the average value of learning styles is 8.12 while the average value of learning outcomes is 34.56. It shows that the relationship between visual, audiotorial, and kinesthetic learning styles positively impacts students' mathematics learning outcomes.

This study follows with previous research, namely research conducted by (Suri et al., 2022) which showed that there was a positive and real relationship between student learning styles and mathematics learning outcomes, as well as a positive and significant relationship between visual learning styles audio, kinesthetic with learning outcomes of mathematics that obtained the results of research variables X and Y showed a positive relationship with a correlation of 0.42 at the level of the medium criteria. Another study (Sari & Sartika, 2021) conducted showed a significant correlation between learning styles and science learning outcomes, so the results between variables X and Y showed a positive correlation of 0.40 at the low criterion level.

Conclusion

The conclusion obtained from the results of this study is aimed at analyzing the correlation between VAK learning styles and mathematics learning outcomes in elementary school students. Quantitative correlation is a research method used with an ex post facto design. *Non Probability Sampling* is a technique used in sampling. Researchers applied different learning styles so that students are more active in asking questions, and they are confident in asking questions and giving their opinions when the teacher explains or during discussions. Regarding mathematics, there are learning outcomes, where 34.16 is the average score with the acquisition of 81.12 as the average score related to kinesthetic, visual, and auditory as learning styles. For the results of hypothesis testing using the person product moment correlation formula, the value obtained is 0.7153 > 0.361. Then reject and accept which means that there is a relationship between visual, auditory, and kinesthetic learning styles with mathematics learning outcomes in third grade students at SDN Srengseng Sawah 04. So, there is a significant correlation between visual, auditory, and kinesthetic learning

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styles with mathematics learning outcomes in students. The interpretation of the coefficient is a high degree of correlation.

Recommendation

Based on the results of the study, there are several suggestions, including: (1) Regarding learning styles, educators are expected to be more adaptable in selecting learning styles for students, which aims to ensure that the learning process can run well without obstacles. (2) Students are expected to be positive, creative and enthusiastic during the learning process. The learning process provided by educators should be easy to understand, optimize learning styles, and continue to practice problem solving. (3) For further researchers to continue this research in more detail, especially on the scope of learning outcomes, both learning styles or other factors that have a relationship.

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