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The Influence of the STEAM Learning Model on Motivation and Results in Science Learning in Class V Students

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ABSTRACT

The study's objective was to determine how the STEAM Model affected fifth-graders at SDI Biringkaloro Gowa's science learning results and motivation. This type of research is essentially an experiment. In this study, the quasi-experimental design takes the shape of a quantitative study with the kind of quasi-experimental research, where the design has a control group but can't fully function to control outside factors that influence how the experiment is carried out. The experimental group and the control group were the two groups used in this investigation. There are 60 students involved as the sample in this study. The 30 students as experimental group or class will employ the STEAM learning model, while the control class which includes the other 30 students will conduct the learning without using the STEAM learning model. The data were investigated using statistical analysis techniques such as validity analysis, descriptive statistical analysis, and inferential statistical analysis. The data was processed using the IBM SPSS 27 application. Homogeneity, normality, and MANOVA hypothesis testing were among the tests performed. According to an examination of the Manova test findings, which indicated a significant value of 0.000, the STEAM learning model has an effect on the motivation and academic performance of fifth grade students at SDI Biringkaloro Gowa. H0 is rejected and Ha is acceptable if 0.000 0.05. This suggests that the STEAM learning paradigm's implementation at SDI Biringkaloro Gowa has a significant impact on students' motivation and science learning outcomes.

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1. INTRODUCTION

The three areas of cognitive (knowledge), emotional (attitude), and psychomotor (skills) alter as a result of education. Numerous initiatives have been attempted to accomplish the objective and raise educational standards. High drive to acquire the best learning results is one of the determinants of student accomplishment. One of the elements that fosters students' love for studying is motivation. (Husni, Musnadi, S., 2018). Education aims to form quality human resources who are knowledgeable and religious (Undang-Undang Republik Indonesia No. 20 tahun 2003 about Sistem Pendidikan Nasional, 2017). Education also develops students' potential to become human beings who believe in and fear God Almighty and have noble character. Learning science stresses the process of offering direct experience regarding a notion in accordance with Ministerial Regulation Number 22 of 2006, which explains that science is a subject related to how to learn about nature in a methodical way. Therefore, science is a process of discovery as well as the mastery of collections of

information in the form of facts, concepts, or principles. The focus of science instruction in SD/MI is on giving hands-on learning opportunities (Yudhasmara & Solihatin, 2018).

This is because in learning it still shows the teacher centered learning process, as a result student activities are limited to listening to teacher lectures, and working on practice questions on LKS (Student Worksheets). Students have not been able to give examples and explain back the material being studied. This causes students to tend to be passive and only accept material from what has been conveyed by educators without developing it independently. The science learning process should not only be limited to transferring knowledge, but also building a process of discovery that involves the active role of students in building motivation to gain an in-depth understanding of concepts, not just rote memorization (Khairuddin, Sujarwo, & Atmowardoyo, 2019).

Solutions to increase student motivation and learning outcomes have been carried out a lot. In the last seven years several studies have been carried out applying various learning models, including the application of the (Ni Luh Esi Yani, Made Sedana, 2021) the make a match model (Indarta et al., 2022), the project based learning model (Melindayani, 2022), (Wahyuni et al., 2023), and the (Ristiana, 2021) from all of these learning model studies have one thing in common, namely providing direct experience to students.

(Hawari, A. D. M., & Noor, 2020) argues that STEAM is an integrated learning model of Science, Technology, Engineering, Art and Mathematics as a forum for developing student inquiry activities, communication skills and critical thinking in learning. This is based on 3 aspects, namely learning outcomes, responses and activities towards learning. In the journal it is stated that student learning outcomes have increased significantly, positive responses and students who are actively involved during learning (Fitriyah & Ramadani, 2021). (Lo et al., 2022) According to the statement, STEAM is a scientific field that combines science, technology, engineering, art, and mathematics. This method can be used to enhance education in schools. According to (Nurwulan, 2020) STEAM is a meta-discipline that combines science, technology, engineering, art, and mathematics into a cohesive method that may be used in classroom instruction.

According to (Indah Arsy, 2021) put forward the steps of the STEAM learning model, namely 1) Reflection, bringing students into a problem and providing motivation to investigate and solve, 2) Research, digging up information from various relevant sources, 3) Discovery, bridging between research and application in designing a project, 4) Application, testing products or solutions in solving problems, 5) Delivering from a project or solution,

Each learning model in use today has benefits and drawbacks when it comes to the learning process. As stated by (Hasanah, 2021) 1) Fostering a grasp of the connections between principles, concepts, and domain knowledge in certain fields is one advantage of this methodology. 2) Developing pupils' critical thinking and imagination while piqueing their curiosity. 4) Promoting cooperative problem-solving and interdependence in group work, 5) Assisting students in understanding and engaging with the scientific inquiry process, and 6) 5) Increasing students' knowledge of math and science; 6) Developing their active memory through independent learning; and 7) Encouraging connections between learning, doing, and thinking 8) Increasing student engagement, participation, and attendance; 10) fostering students' capacity for knowledge application. The STEAM learning model's shortcomings, according to (Nuragnia et al., 2021), namely: It takes a long time to solve problems, experiments and information gathering are difficult for students, students may be less engaged in group projects, and if each group's topic is different, students may not be able to comprehend the topic as a whole.

The STEAM learning paradigm is a teacher's endeavour to inspire student motivation for learning., (Sardiman, 2019), claims that students' general enthusiasm for learning is what drives them to engage in learning activities that ensure their continuity and give learning activities direction so that they achieve the objectives of the subject they are studying (Putra, 2022). To increase student motivation, follow these steps: 1) Clearly state the objectives to be met; 2) pique student interest; and 3) foster a pleasant learning environment. 4) Teachers must be able to offer content in a number of ways, make the most of the learning environment, employ a variety of learning methods, and be able to get support from media or other sources. 5) Give each student fair credit for their accomplishments in 6. Provide an assessment in (Dumitriu, 2019).

The indicators of learning motivation according to (Handoyono, 2022; Krismony et al., 2020) mention indicators of learning motivation, namely, 1) Diligent in facing tasks (can work nonstop for a very long time, without stopping before completing), 2) Tenacious in overcoming challenges 3) Express interest in a range of issues: 4) Prefers to work alone, 5) Doesn't get tired easily with mundane jobs, 6) Can defend His Opinion, 7) Doesn't Give Up Things He Believes, 8) Enjoys Problem-Solving.

When discussing learning outcomes, it can be said that they are either mental or (psychic) activity that occurs due to active interactions between individuals and their environment which results in relatively permanent changes in cognitive, psychomotor and affective aspects. Basically the notion of learning according to (Damayani et al., 2021) is "a component of educational science with regard to the goals and reference materials for interaction, both explicit and implicit (hidden)". Furthermore, (Hardiyana & Yudistira, 2018) explains that learning can be interpreted as a process to acquire competence. The intended competence includes knowledge, skills, and attitudes. According to (Susanto, 2019) the "Learning outcomes" refers to the adjustments pupils

make as a result of learning activities in terms of their cognitive, emotional, and psychomotor functioning.. (Sigalingging, D., Sitepu, A., & Silaban, 2022) (1) Internal factors are those that students have that affect their learning abilities, such as intelligence, interest and attention, learning motivation, perseverance, attitude, study habits, as well as physical condition and health. (2) External factors are elements that influence learning outcomes but are independent of the student, such as family, school, and community.

The existing research has shown that STEAM learning can have a positive impact on students' motivation, learning outcomes, such as increased engagement and participation, problem solving skills, and critical thinking skills. Based of the existing research, it is likely that students in the STEAM learning group will have higher motivation and learning outcomes in any subjects than students in the control group. However, there is a need for more research on the impact of STEAM learning on specific subject learning outcomes. Thus, this study aims to investigate how the STEAM learning model affected fifth-graders at SDI Biringkaloro Gowa's science learning results and motivation.

According to (Tirmayasari et al., 2019) Science, or IPA, is knowledge that is created by specialists based on scientific procedures and investigates the cosmos, its contents, and the events that take place in it. The dictionary's definition of natural science is (Rusydiyah et al., 2021) Natural science is described as a body of information about natural occurrences and objects that has been gathered via scientific inquiry and investigation employing experimental techniques and scientific methodologies. Natural sciences (IPA) are meant to teach students about the world in which they live and appropriate behavior, to instill a scientific outlook on life, to equip students with the skills necessary to make observations, to teach them to recognize, understand, and respect the scientists who came up with new ideas, as well as to use and apply scientific methods. addressing problems using science.

2. METHOD

With this kind of research, quantitative research is utilized.a quasi-experiment (pseudo-experiment) is an experiment with a control group but insufficient power to adequately control the external factors influencing how the experiment is carried out. (Sukmawati, Salmia, 2023). The experimental group and the control group were the two groups used in this investigation. The control class will not use the STEAM learning approach; instead, they will study in the same manner as the experimental group or class. The design in this research design uses a research design *nonequivalent control group design* (Sari, 2022). The experimental class and the control class are not chosen at random when employing this design selected and provide *pretest* and *posttest* in each of these classes (Sugiyono, 2019), At the Biringkaloro Inpres Elementary School in the Pallangga Gowa District, this study will be carried out. The study period will take place during the second semester of the school year 2022/2023.

The 60 participants in this study were all fifth graders at Pallangga Gowa District's Inpres Biringkaloro Elementary School. The sampling method used in this study is non-probability saturation sampling. The sample size for this study was 60 persons, including 30 from class V A and 30 from class V B. The study's type of data was quantitative, consisting of information gleaned from observations of student motivation and learning outcomes as well as information gleaned from test results on student learning. The observation sheet instrument of written knowledge examinations that measure learning motivation and achievement include multiple-choice questions as its data source. (Sukmawati, Sudarmin, 2023).

The method for gathering data is as follows. The observation sheet utilized in this study is shaped like a scaleguttman and contains statements with preset answers that can be answered through observation, testing, and documentation. The data analysis method in quantitative research makes use of statistics. Utilizing statistical analysis approaches, including validity analysis, descriptive statistical analysis, and inferential statistical analysis, the data were examined. An application called IBM SPSS 27 is used for data processing. The normality test, homogeneity test, and MANOVA hypothesis are the tests run.

3. RESULTS AND DISCUSSION

Results

Discussions and conclusions from scientific study are included in the outcomes. Record any scientific conclusions that were reached as a result of completed research, but they must be backed up with sufficient evidence. The scientific conclusions that are being discussed here are not those drawn from the collected research data. The scientific explanation of the findings must include information like: What scientific findings were made? Why was it the case? Why do trend variables behave in that way? All of these issues need to be scientifically addressed, not just described, and where appropriate, substantiated by relevant scientific occurrences. It should also be described in relation to the findings of other researchers who have studied a nearly same subject. The study findings and outcomes must be able to support the stated research objectives in the.

To ascertain whether the instruments or measurement tools employed in the study were valid (measuring what should be measured), the validity of the instruments used in data collection was assessed. The validation process include content validation, which looks at the instrument's content and format. In this study, the Gregory technique will be used to determine the content validity. The outcomes are displayed as follows.:

Table 1 Results of Content Validity Test of Research Instruments

Instrument Type	Results	Criteria	Information
Learning Motivation Observation Sheet	1,00	Very High Validity	Valid and proper to use
Science Learning Outcomes Test	1,00	Very High Validity	Valid and proper to use

Table 1's findings from the research instruments' content validity test indicate that all of them have extremely high levels of validity. The science learning accomplishment test has a content validity value of 1.00 with very high validity standards, while the observation sheet of learning motivation has a value of 1.00 with very high validity requirements. To determine how well an instrument can measure the desired concept in research, content validity is used. In this instance, all of these tools are deemed to be legitimate and practicable for use in assessing the construct under investigation. High validity means that the measurement is actually being made by the device.

The maximum value, minimum value, average, standard deviation, and variance were determined after the data from the pretest and posttest results of the experimental class and the control class were analyzed (Alfianiawati et al., 2019). SPSS 27 for Windows software was used to collect data on student learning outcomes and learning motivation in both the experimental class and the control class.

Table 2 Frequency Distribution of Experiment Class Learning Motivation

Interval	Category	Pretest		Posttest	
		Frequency	Percentage (%)	Frequency	Presentation (%)
13,51-18	Very high	0	0%	5	16,6%
9,1-13,5	Height	0	0%	17	56,6%
4,51–9	Currently	12	40%	8	26,6%
0-4,5	Low	18	60%	0	0%
Amount		30	100%		

Categorizing the percentage value of learning motivation in fifth grade students of SDI Biringkaloro with a prestest score that has a moderate interval value of 12 students a percentage of 40%, an interval of scores of 18 students a percentage of 60%, and very high and high value intervals no students reach the category. For the percentage of learning motivation in the posttest, 5 people got very high score intervals with a percentage of 16.6%, high score intervals with a total of 17 students got a percentage of 56.6%, medium score intervals with a total of 8 students got a percentage of 26.6% and for low value interval no students reach the category.

Table 3 Descriptive Statistics of Experimental Class Learning Outcomes

Variable	Experiment class Science Learning Outcomes	
	Pretest	***Posttest***
N	30	30
Range	30	30
Nilai Minimum	40	70
Maximum Value	70	100
Sum	1690	2505
Mean	56.33	83.50
Standard Deviation	10.581	8.625

Based on the table above, the data for class V SDI Biringkaloro students consist of 30 students. The minimum score on the pretest is 40 and the minimum posttest score is 70 while the maximum pretest score is

70 and the posttest increases to 100, the mean or average pretest is 56.33 and the posttest increases to 83.50. The overall value of the pretest was 1690 and after being given the posttest it increased to 2505.

Inferential Analysis Results

A normality test and a homogeneity test made up the traditional assumption test in this study before the hypothesis testing or inferential analysis was done. The test for homogeneity is the test Levene Statistic, and the test for normalcy is the test Kolmogrov-Simirnov. In relation to student motivation and learning outcomes, the results of the normality test and homogeneity test of the pretest and posttest data of the experimental class and control class are described as follows.:

Learning Motivation Normality Test

Table 4 Learning Motivation Normality Test

Tests of Normality				
	Class	**Kolmogorov-Smirnov[a]**		
		Statistic	**df**	**Say.**
Motivation to learn	Pretest Kontrol	.133	30	.183
	Posttest Control	.146	30	.105
	Experiment Pretest	.151	30	.079
	Posttest Experiment	.128	30	.200*
a. Lilliefors Significance Correction				

Based on the aforementioned data, the analysis of the pretest normality test using the control class and Kolmogorov-Smirnov's test results revealed that the data was normally distributed, with a significant value of 0.183 > 0.05 for the pretest and a significant value of 0.105 > 0.05 for the posttest. While the analysis of the pretest normality test in the experimental class used Kolmogorov-Smirnov, the test is known to have a significant value of 0.079 > 0.05, and the posttest is known to have a significant value of 0.200 > 0.05, it is possible to conclude that the data is normally distributed.

Learning Outcome Normality Test

Table 5 Normality Test of Learning Outcomes

Tests of Normality				
	Class	**Kolmogorov-Smirnov[a]**		
		Statistic	**df**	**Say.**
Learning outcomes	Pretest Kontrol	.153	30	.073
	Posttest Control	.152	30	.063
	Experiment Pretest	.136	30	.168
	Posttest Experiment	.158	30	.055
a. Lilliefors Significance Correction				

The study of the pretest normality test utilizing the control class Kolmogorov-Smirnov method's findings are based on the data above.Since the posttest is known to have a significant value of 0.063 > 0.05 and the test is known to have a significant value of 0.073 > 0.05, it is possible to infer that the data are normally distributed. While the analysis of the pretest normality test in the experimental class using Kolmogorov-Smirnovthe test is known to have a significant value of 0.168 > 0.05, it is possible to conclude that the data is normally distributed and the posttest is known to have a significant value of 0.55 > 0.05.

Homogeneity Test

Learning Motivation Homogeneity Test

Table 6 Homogeneity Test of Learning Motivation

Tests of Homogeneity of Variances					
		Levene Statistic	df1	df2	Say.
Motivation to learn	Based on Mean	.637	1	58	.428
	Based on Median	.622	1	58	.434
	Based on Median and with adjusted df	.622	1	50.212	.434

	Based on trimmed mean	.636	1	58	.428

The significant value (sig.) of learning motivation is known to be 0.428 > 0.05 based on the data above, tested using the outputTest Of Homogeneity Of Variances, and it can be inferred that the variance of learning motivation data is the same or homogeneous.

Homogeneity Test of Learning Outcomes

Table 7 Homogeneity Test of Learning Outcomes

Tests of Homogeneity of Variances					
		Levene Statistic	df1	df2	Say.
Learning outcomes	Based on Mean	.000	1	58	.993
	Based on Median	.016	1	58	.900
	Based on Median and with adjusted df	.016	1	56.676	.900
	Based on trimmed mean	.000	1	58	.996

It can be determined that the variance of the learning outcomes data is the same or homogenous based on the data above, which was tested using the outputTest Of Homogeneity Of Variances. The significance value (sig.) of the learning outcomes is known to be 0.993 > 0.05.

Hypothesis Results

The hypothesis of the problem formulation was tested with Manova with*Test of between Subject Effect.* Manova was utilized to examine how the STEAM Learning Model affected fifth-grade students at SDI Biringkaloro in Pallangga Gowa District's motivation and science learning outcomes with the notion of temperature and heat. Testing is conducted using helpSPSS for Windows at a 5% level of significance. The STEAM Learning Model has an impact on students' motivation and science learning outcomes for the idea of temperature and heat in the fifth grade at SDI Biringkaloro if the significance value is less than 0.05, which indicates that H0 is rejected. Pallangga Gowa District. The test statistic in the MANOVA analysis used in this study is the Hottelling's Trace because there are only two prerequisite variables for the normality and homogeneity of variance-kivariance tests.

Table 8 Manova Test

Source	**Variable**	**Calculated Significance Value**
STEAM Learning Model	Motivation to learn	0,000
	Learning outcomes	0,000

Student learning outcomes and motivation both have significance values of 0.000 in the table of Manova test findings. If 0.000 0.05, H0 is rejected and Ha is approved. Based on these findings, it can be concluded that the application of the STEAM Learning Model has a substantial impact on students' motivation and learning outcomes for the science concepts of temperature and heat in the fifth grade at SDI Biringkaloro Gowa.

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Discussion

According to the study of the Manova test results, the STEAM learning model has a significant impact on the motivation and academic performance of SDI Biringkaloro Gowa fifth grade pupils, with a significance value of 0.000. When 0.000 0.05, H0 is turned down and Ha is approved. This leads to the conclusion that the application of the STEAM learning paradigm has a significant impact on motivation and science learning results at SDI Biringkaloro Gowa.

Students can engage in active learning through the use of the STEAM learning model and engage in the learning process in the context of everyday life. Through this approach, students are encouraged to observe or make observations of various phenomena, find ideas, innovate, be creative and get social values that can be useful in everyday life.

Previous research conducted by (Jewaru, 2019) showed that the Increase in The STEAM model had an impact on the science learning outcomes for eighth graders in the excretory system material. Similar to the learning outcomes, there are also noticeable disparities between the two classes in the affective and psychomotor domains. While the cognitive domain learning results also demonstrate a substantial influence.

4. CONCLUSION

The significance value (sig.) of learning motivation is 0.428 > 0.05, which indicates that the variance of the data on learning motivation is the same or homogeneous, according to the findings of the research and discussion above. Additionally, based on the data above, using the output of the Test of Homogeneity of Variances, it is known that the variance of learning motivation is 0.428 > 0.05. By using the output of the Test of Homogeneity of Variances, it can be determined that the variance of learning achievement data is the same or homogeneous and that the significance value (sig.) of learning outcomes is 0.993 > 0.05, allowing it to be concluded that there is an influence of the learning model STEAM on the motivation to learn IPA as well as an influence of the learning model STEAM on learning outcomes. The findings of this study can be used by other researchers to inform future investigations into the factors used in this study. Despite the limitation of this research that only focusing on overall science learning outcomes and being a short-term study, future studies should investigate the impact of STEAM learning on specific aspects of science learning outcomes and the long-term effects of STEAM learning on student motivation and learning outcomes.

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