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The Effect of the Inquiry Learning Model

on Mathematics Learning Outcomes

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Abstract

The purpose of this study is to determine the effect of Mathematics learning outcomes on learning using the Inquiry model. This study is a true experimental design study. The sampling technique employs the Probability Sampling type, specifically Cluster Sampling (Area Sampling). The sample in this study The subjects were 3rd grade students of Mangunsari 04 Elementary School, Salatiga City, as the experimental class and Mangunsari 07 Elementary School as the control class, with a total of 49 students. Data collection was conducted using observation, documentation, and testing methods. Data analysis using descriptive techniques and statistical analysis. The results of the study indicate that there is a significant influence on mathematics learning outcomes using the Inquiry learning model. This is shown after the t-test was conducted, the calculated F value was 0.390, and the significance level was 0.536 or > 0.05. The calculated F value was greater than 0.05; therefore, F was significant. The use of the inquiry learning model emphasized student activities in the learning process, allowing students to find their own answers to a problem being studied.

Keywords: Inquiry Learning Model, Mathematics learning outcomes

Abstrak

Tujuan penelitian ini adalah untuk mengetahui pengaruh hasil belajar Matematika terhadap pembelajaran menggunakan model Inkuiri. Penelitian ini merupakan penelitian dengan desain eksperimental murni. Teknik pengambilan sampel yang digunakan adalah Probability Sampling, yaitu Cluster Sampling (Area Sampling). Sampel dalam penelitian ini adalah siswa kelas III SD Mangunsari 04, Kota Salatiga sebagai kelas eksperimen dan SD Mangunsari 07 sebagai kelas kontrol dengan total 49 siswa. Pengumpulan data dilakukan dengan metode observasi, dokumentasi, dan tes. Analisis data menggunakan teknik deskriptif dan analisis statistik. Hasil penelitian menunjukkan bahwa terdapat pengaruh signifikan terhadap hasil belajar Matematika dengan menggunakan model pembelajaran Inkuiri. Hal ini ditunjukkan setelah uji t diperoleh nilai F hitung sebesar 0,390 dan tingkat signifikansi 0,536 atau > 0,05. Nilai F hitung > 0,05 berarti F signifikan, dengan penggunaan model pembelajaran Inkuiri yang menekankan aktivitas siswa dalam proses pembelajaran untuk dapat menemukan jawaban sendiri terhadap suatu masalah yang dipelajari.
Kata Kunci: Model Pembelajaran Inkuiri, Hasil Belajar Matematika

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INTRODUCTION

Mathematics plays a vital role in everyday life, as it often requires mathematical skills to solve problems, such as measuring, counting, and weighing. Mathematics should be taught to all students, starting from elementary school, to equip them with logical, analytical, systematic, critical, and creative thinking skills, as well as the ability to collaborate. These competencies are essential for students to acquire, manage, and utilize information to survive in ever-changing, uncertain, and competitive environments.

Mathematics, according to Amir, A (2014) says that Mathematics is abstract ideas given symbols, so mathematical concepts must be understood first before manipulating these symbols. As a subject, mathematics has an important role in shaping the character and way of thinking of students. According to Sinaga, R (Jeheman et al., 2019) it is very inappropriate if mathematics is said to live for itself, but mathematics has a universal role for other sciences and in the development of modern technology.

It is proper that learning mathematics should be gradual and sequential in a systematic manner and based on previous experiences. According to Firmansyah, D (Ruseffendi, 1991), "Learning mathematics is learning concepts starting from real concrete objects intuitively, then at higher stages, the concept is taught again in a more abstract form using a more general formula used in mathematics". Based on several expert opinions, it can be concluded that Mathematics is a learning process that starts from real, concrete objects and continues at higher stages, then the concept is taught again in a more abstract form. by using understandable formulas to be able to follow the development of modern technology.

Current mathematics instruction tends to be feared by students. Many students struggle with solving math problems; teachers simply lecture, explain, give examples, and assign homework. Teachers rarely engage in discussions about the material presented. Only a few students understand the teacher's explanations, while others don't. Students who don't understand the teacher's explanations generally don't dare ask questions. Therefore, strategies are needed to engage students in mathematics learning.

Primary and Secondary Education (Permendikdasmen) Number 13 of 2025 concerning Philosophical Foundations states that Education must develop higher-order thinking skills such as the ability to analyze and synthesize, so that students are able to understand and face complex challenges, especially in

mathematics learning. This is in line with NCTM (Nyala et al., 2016) which states that the undeniable fact that problem solving is one of the process standards that is quickly becoming key in mathematics learning.

Current mathematics instruction tends to be feared by students. Many students struggle with solving math problems; teachers simply lecture, explain, give examples, and assign homework. Teachers rarely engage in discussions about the material presented. Only a few students understand the teacher's explanations, while others don't. Students who don't understand the teacher's explanations generally don't dare ask questions. Therefore, strategies are needed to engage students in mathematics learning.

One component that influences student engagement and contributes to the success of a learning process is the learning model. Selecting and using the right model can stimulate student activity and critical thinking, which in turn impacts learning outcomes. However, most teachers still use conventional teaching methods, such as lectures and question-and-answer methods. This is even though many learning models and methods can encourage students to be more active in participating in learning activities.

Based on field observations by taking samples of two Public Elementary Schools in the Kartini Cluster, namely through interviews with grade 3 teachers of Mangunsari 04 Public Elementary School, Salatiga City as an experimental class, students who actively participate in Mathematics learning are only 10 people out of a total of 25 students, or in other words the level of student activity in participating in Mathematics learning is very less than expected and learning is still centered on the teacher. The cause is the lack of parental attention to the development of children, especially in participating in learning at school, because the majority of parents work as street vendors.

Teachers have not implemented innovative learning models, but only use conventional methods in the sense of lectures, questions and answers, and assignments. The lack of student interest in learning mathematics, and from the results of my observations, it turns out that during the learning process, it only takes place monotonously. During the learning process, many students are busy playing with their classmates and do not listen to the teacher who is explaining the material in front of the class because it is ingrained in the students' minds that mathematics is a difficult subject to learn. Student learning outcomes are affected by the conditions described above, seen in the learning outcomes of approximately 60% of students out of a total of 25 students with a KKM of 70.

Field observations and interviews at Mangunsari 07 Elementary School, Salatiga City, as a control class, revealed that only 65% of 24 students had achieved a minimum passing grade (KKM) of 70 in Mathematics. Teachers

continued to use conventional methods, including lectures, Q & A sessions, and assignments. Many students were busy playing with their deskmates and throwing papers at each other while the teacher presented the material. Many students disliked and considered mathematics difficult, leading them to pay little attention to the teacher's explanations.

Judging from the actual conditions in the field, there is a gap between ideal and actual conditions at SDN Mangunsari 04 and SDN Mangunsari 07 in Salatiga City, which causes a problem, namely the failure to achieve completeness of student learning outcomes. A *treatment* in learning is needed in the form of the application of varied learning models/methods. Choosing the right learning model can generate better learning activities and student learning outcomes.

Various creative learning models can improve students' abilities in mathematics. One learning model that can be applied to improve student learning outcomes is *inquiry-based learning. Inquiry-based* learning provides students with the opportunity to think critically in solving problems presented by the teacher. *Inquiry-based learning*, or discovery learning, provides students with the opportunity to discover concepts for themselves through experimentation.

Inquire is one of the models of learning that is closely related to placing students as active learning subjects, which is in line with the opinion of Siagian, RE F and Nurfitriyanti. M (Mulyasa 2003:234) states that " *The inquiry* model is a model that can lead students to realize what has been obtained during the learning process. Meanwhile, according to Jufri (2013) states that *inquiry* is a process that develops basic scientific abilities and includes observing, classifying, calculating, formulating hypotheses, making spatial and temporal relations, measuring, interpreting data, designing experiments, and so on.

It is hoped that through the *Inquiry model*, students will be able to analyze and critique a given problem themselves so that they will be able to solve various problems they face. The *Inquiry Model* is expected to encourage students to understand the many problems, then think about how students can conduct an authentic investigation and be able to investigate problems that require real solutions to real problems.

Apart from being able to improve students' critical thinking, learning using the Inquiry model *emphasizes the* problem-solving process. Based on the background described above, the formulation of the problem studied in this study is "Is there a positive and significant influence on the Mathematics learning outcomes of grade 3 students of SD Negeri Mangunsari o4 in learning using the *Inquiry model?"*

METHOD

This research is an experimental study, using *a true experimental design*. The design used is *a Nonequivalent Control Group Design*. This design is used because only in this design are the experimental group and the control group not selected randomly (Sugiyono, 2009: 116). This study used two classes: one as the experimental class and one as the control class. The research design is described as follows: which is presented in table 1.

Table 1 Research Design

Group	*Pretest*	Independent Variable	*Posttest*
Experiment	O_1	X_1	O_2
Control	O_3		O_4

Information:
O_1 = pretest score of experimental class
O_2 = posttest value of experimental class
O_3 = pretest value of control class
O_4 = posttest score of control class
Experiment = experimental class
Control = control class

The population used in this study was the 3rd-grade students of Gugus Kartini, Salatiga City, semester G odd school year 2025/2026. The sampling technique used was the *Cluster Sampling technique* (Area Sampling). After the sampling was carried out, it was obtained SD Negeri Mangunsari 04 as the experimental class was given *the Inquiry learning model* and SD Negeri Mangunsari 07 as the control class was given the conventional method.

The data collection methods in this study were documentation, observation, and testing. The documentation method was used to obtain initial ability data from the students who were part of the research sample. Meanwhile, the testing method was used to obtain data on student learning outcomes on the perimeter of squares and rectangles using descriptive test questions that had been previously piloted. The learning outcomes measured consisted of two stages: the initial stage obtained from *pretest scores* and the final stage with *posttest scores.*

The pretest was conducted before treatment was given; the purpose of the pretest was to determine the initial abilities of students' learning outcomes. *The posttest* was conducted after treatment was given using the *Inquiry Learning*

model. The purpose of *the posttest was to determine the effect of the Inquiry* Learning model on mathematics learning outcomes. The observation method was used to observe student activities during the learning process. The data analysis techniques used in this study were (1) normality testing using the technique of *Shapiro-Wilk*, (2) homogeneity test using the *Levene test*, and (3) *independent sample t-test*.

RESULTS AND DISCUSSION

Based on the results of the analysis at the initial stage through the *Shapiro-Wilk* test with a significance level of 5% using *SPSS,* it is known that the *pretest values* of the experimental class and the control class are significant. This can be seen in the *Shapiro-Wilk column* if $\sum$ <50 shows figures of 0.325 > 0.05 and 0.229 > 0.05. where the figure has exceeded the significance figure of 0.05 and is normally distributed, as shown in Table 2, namely the results of *the pretest* normality test for the experimental class and the following control class.

Table 2 Results of *the pretest* normality test for the experimental class and control class

Tests of Normality							
	factor	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	Df	Sig.
Pretest value	1	,167	25	,069	,955	25	,325
	2	,200	24	,014	,947	24	,229
a. Lilliefors Significance Correction							

The results of the normality test analysis on the *posttest* data are normally distributed. This can be seen from the significant data in the *Shapiro-Wilk column* if $\sum$ <50 shows the numbers 0.573 and 0.613 where these numbers have exceeded the significance number of >0.05, shown in Table 3, namely the results of *the posttest normality* test *for* the experimental class and the following control class.

Table 3 Results of the *post -test* normality test for the experimental class and the control class

Tests of Normality							
	Factor	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
		Statistics	Df	Sig.	Statistics	Df	Sig.
Posttest value	1	,105	25	,200 [*]	,967	25	,573
	2	,105	24	,200 [*]	,968	24	,613
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

After the normality test in the form of normal distribution of data is fulfilled, the researcher then conducts a homogeneity test or the level of data equality by conducting a homogeneity test. Through the data homogeneity test in the output table *of the Test of Homogeneity of Variances* with a significance level of 5%, a significance number is obtained. is for the probability *based on mean* = 0.733, for *based on median* = 0.989, then for *based on median and with adjusted df* = 0.989, and probability *based on trimmed mean* = 0.735. The conclusion of the data obtained is homogeneous, because the probability of the data population > 0.05, shown in Table 4, namely the homogeneity test *of the* experimental class and the control class. following.

Table **4 Homogeneity test** *P* **retest Experimental Class and Control Class**

Test of Homogeneity of Variance					
		Levene Statistics	df1	df2	Sig.
Pretest value	Based on Mean	,117	1	47	,733
	Based on Median	,000	1	47	,989
	Based on Median and with adjusted df	,000	1	40,794	,989
	Based on the trimmed mean	,116	1	47	,735

Based on *the posttest* value, it shows a significance figure *based on mean* = 0.536, *based on median* = 0.560, *based on median and with adjusted df* = 0.560, and probability *based on trimmed mean* = 0.555. *The overall probability value shows a significance figure* > 0.05, so it can be concluded that the population of posttest data for the experimental and control groups has the same or homogeneous variance, shown in Table 5, namely the *posttest* homogeneity test for the experimental class and the control class. following.

Table **5 Posttest Homogeneity Test Experimental Class and Control Class**

Test of Homogeneity of Variance					
		Levene Statistics	df1	df2	Sig.
Posttest value	Based on Mean	,390	1	47	,536
	Based on Median	,344	1	47	,560

Based on Median and with adjusted df	**,344**	**1**	**45,819**	**,560**
Based on trimmed mean	**,353**	**1**	**47**	**,555**

Based on the calculation of student learning outcomes in the experimental and control classes, in summary, the results of the t-test calculations were carried out with SPSS *using* the *Independent sample T-Test*. The calculation of the difference test for the average pretest and posttest learning outcomes is in Table 6 below.

Table 6 Results of the Difference Test for the Average *Pretest Scores* of the Experimental Class and the Control Class

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Standard Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
prete st value	Equal varianc es assume d	**,11 7**	**,73 3**	**3,15 0**	**47**	**,003**	**12,033**	**3,820**	**4,349**	**19,71 8**
	Equal varianc es not assume d			**3,14 4**	**46,06 7**	**,003**	**12,033**	**3,828**	**4,329**	**19,73 8**

Based on Table 6, the calculated F result of Levene test is 0.117 with a probability of 0.733 > 0.05, which means that both populations have the same variance or in other words, both classes are homogeneous, thus the analysis of the t-test difference test of the *pretest value* of the experimental class and the control class must use the assumption of *equal variance assumed*. Based on Table 6, it can be seen that the t value is 3.150 with a significance probability of 0.003 < 0.05, so it can be concluded that H0 is rejected, meaning there is an influence of *the Inquiry* learning model on the mathematics learning outcomes of grade 3 students of Mangunsari 04 Elementary School, Salatiga City. The average difference is 12.033.

Table 7 Results of the Difference Test for Average *P-test Values* experimental class and the control class

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Standard Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
posttest value	Equal variances assumed	,390	,536	8,438	47	,000	27,175	3,221	20,696	33,654
	Equal variances not assumed			8,409	45,083	,000	27,175	3,232	20,666	33,684

Based on Table 7, the calculated F result of Levene test is 0.390 with a probability of 0.536 > 0.05, which means that both populations have the same variance or in other words, both classes are homogeneous, thus the analysis of the t-test difference test of the *posttest value* of the experimental class and the control class must use the assumption of *equal variance assumed*. Based on Table 7, it can be seen that the t value is 8.438 with a significance probability of 0.000 < 0.05, so it can be concluded that H0 is rejected, meaning there is an influence of *the Inquiry learning model* on the mathematics learning outcomes of grade III students of Mangunsari 04 Elementary School, Salatiga City. The average difference is 27.175.

The results of *the Inquiry* learning model in the experimental class were better than the learning outcomes using conventional methods in the control class. This is because in experimental learning, students are more active in learning to find formulas, understand formulas for use in solving problems, discuss problem solving, and present the results of discussions in front of the class.

The learning process in the experimental class uses *the Inquiry* learning model, which is able to create an interesting learning atmosphere with the independence of students to find their own solutions to their problems, which is able to encourage students to be active. Student activeness can be seen when many students actively ask questions about the material on the perimeter of squares and rectangles, group discussions run well, and students do the assignments given by the teacher seriously and earnestly.

During the learning process, students are allowed to find the formula for the perimeter of a square and a rectangle by measuring the square and rectangular shapes provided by the teacher. Before students measure the square and rectangular shapes to find their perimeter, students are invited to hypothesize first about the square and rectangular shapes that each student has received.

After that, students write the results of their hypotheses in the worksheet. Then, students are formed into groups that have been randomized by the teacher to test the hypotheses through group work. Students are given time to discuss finding the results of the hypotheses they have made with their groups, then write the results of their hypotheses in a worksheet. The teacher asks one of the group representatives to present the results in front of the class under the supervision of the teacher, and the teacher provides a conclusion at the end of the lesson.

In this learning, the teacher only acts as a guide and facilitator who directs and guides students if they experience difficulties in the discovery process.

Learning using this inquiry model is very interesting and is felt by students to be very enjoyable and not monotonous. Students' enthusiasm in receiving learning is very high, students are very excited when given the opportunity to be able to measure squares and rectangles themselves directly. The group work opportunities provided by the teacher are carried out well by students. Students together in groups can work together and help each other to get the best results from measuring squares and rectangles.

Student-teacher interactions ran smoothly, and groups experiencing difficulties were encouraged to ask questions. Both teachers and students provided positive feedback throughout the learning process, which makes students more interested in learning mathematics, so that the activeness of students in the experimental class is higher than that of students in the control class.

students are seen more as objects than subjects. In this case, the teacher provided fewer opportunities for students to develop creative, objective, and logical thinking skills, leading to a tendency toward passivity. However, in this conventional learning method, the teacher provided a discussion.

Before the students engaged in the discussion, the teacher first gave a lecture on the formulas for the perimeter of squares and rectangles and a short Q & A session. Then, the students were divided into groups determined by the teacher to work on practice problems on the perimeter of squares and rectangles. This resulted in students not absorbing the knowledge gained, resulting in lower *posttest results* in the control class compared to the experimental class.

The results of the final data analysis of the experimental class and the control class showed that the test results of the experimental class for students taught using *the Inquiry model learning.* better than the control class for students taught using conventional methods due to several things including the following : (1) Students in learning using *Inquiry* are more critical in finding information and teaching materials regarding the formula for the perimeter of squares and rectangles from the activity of measuring squares and rectangles, 2) students in learning using *Inquiry* are more active in asking questions about material that has not been understood, namely the perimeter of squares and rectangles, either asking their group mates or the teacher compared to the class that applies conventional methods, 3) students in learning using *Inquiry* are more active in discussing than students using conventional methods so that students really understand the mathematical concept of the perimeter of squares and rectangles which is directly linked to the process of finding it themselves in measuring activities.

The results of this study are in line with the results of research by Sudiasa, IW (2012) stated that learning mathematics using the Inquiry learning model makes students get higher grades compared to using conventional methods. Fadli (2019) said that learning using the inquiry model can bring out the ability to think critically and actively. The inquiry learning model is able to improve students' understanding of mathematical concepts through the steps in the learning model, where students are encouraged to find problems themselves and provide answers to those problems (Hulu et al, 2023).

CONCLUSION

Based on the results of the research and discussion, it was found that there is an influence on the mathematics learning outcomes of students who are taught using the *inquiry learning model* with students who are taught using conventional learning methods. This can be proven after the *t-test was* conducted, the calculated F result was 0.390 , the significance level or probability was 0.536, because the probability of $0.536 > 0.05$, with the use of the *inquiry learning model* which emphasizes student activities in the learning process to be able to find their own answers to a problem being studied. In contrast to learning using conventional methods, teachers place students more as objects and not as subjects, so Ha is accepted and H0 rejected, meaning that there is a positive and significant influence of learning outcomes in the *Inquiry learning model* on the learning outcomes of grade 3 Mathematics compared to using mathematical abilities learned using conventional methods, on the material of the perimeter of squares and rectangles.

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The Role of Financial Literacy in Moderating the Influence of Self-Confidence and Independent Attitude on Entrepreneurial Interest

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Abstract

This study is motivated by the low level of entrepreneurial interest among students of the Faculty of Economics and Business Education at the Indonesian University of Education. The study aims to examine the effect of self-confidence and independent attitude on entrepreneurial interest, with financial literacy as a moderating variable. The population consisted of 1,305 students who had completed the Entrepreneurship Course, from which 306 students were selected using a proportionate random sampling method. A quantitative approach, employing an explanatory survey method, was used, and the data were analyzed using SEM-PLS. The results indicate that self-confidence and independent attitude have a positive and significant effect on entrepreneurial interest, and financial literacy moderates the influence of both variables on entrepreneurial interest.

Keywords: Development Economics; Self-Confidence; Financial Literacy; Interest in Entrepreneurship; Independent Attitude.

Abstrak

Penelitian ini dilatarbelakangi oleh rendahnya minat berwirausaha mahasiswa Fakultas Pendidikan Ekonomi dan Bisnis Universitas Pendidikan Indonesia (FPEB UPI). Penelitian ini bertujuan untuk menganalisis pengaruh kepercayaan diri dan sikap mandiri terhadap minat berwirausaha dengan literasi keuangan sebagai variabel moderasi. Populasi penelitian berjumlah 1.305 mahasiswa FPEB UPI yang telah menempuh Mata Kuliah Kewirausahaan, dengan sampel sebanyak 306 mahasiswa yang dipilih menggunakan teknik proportionate random sampling. Penelitian ini menggunakan pendekatan kuantitatif dengan metode explanatory survey dan analisis data SEM-PLS. Hasil penelitian menunjukkan bahwa kepercayaan diri dan sikap mandiri berpengaruh positif dan signifikan terhadap minat berwirausaha, serta literasi keuangan mampu memoderasi pengaruh kedua variabel tersebut terhadap minat berwirausaha.

Kata Kunci: Ekonomi Pembangunan; Kepercayaan Diri; Literasi Finansial; Minat Berwirausaha; Sikap Mandiri.

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INTRODUCTION

The Global Goals and the 2030 Agenda for Sustainable Development aim to balance the three dimensions of sustainable development: economic, social, and environmental. According to CNBC Indonesia, the National Labor Force Survey (Sakernas) in August 2023 showed that the number of unemployed in Indonesia reached 7.86 million out of a total workforce of 147.7 million. Data obtained from the Central Statistics Agency (BPS) indicates that the unemployment rate is largely dominated by Generation Z (born between 1997 and 2012). This is evidenced by the unemployment rate data by age below.

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Unemployment Rate by Age Group in 2023

Age Group (years)	Percentage (%)
15 – 24	19.40
25 – 59	3.07
> 60	1.28

Source: Central Statistics Agency (BPS)

Based on research conducted by Wang & Wong, (2004)entrepreneurship education is a recognized factor in helping the younger generation understand and cultivate entrepreneurial attitudes. Entrepreneurship is considered the best alternative for creating jobs and achieving better economic conditions, to achieve *the Global Goals and the 2030 Agenda for Sustainable Development.* (Castro & Zermeno, 2021; García et al., 2017).

Joseph Schumpeter, (1934)in his theory, he explained that economic development can occur through innovation from entrepreneurs. This statement reinforces the reason why today's young generation must have a strong entrepreneurial spirit. Because, over time, entrepreneurship will solve economic, social, and environmental problems. However, based on research survey data conducted by *the Global Entrepreneurship and Development Institute (The GEDI Institute)* in 2019, Indonesia ranked 75th out of 137 countries. The following is *Global data: Entrepreneurship Index* in the ASEAN Region according to *The GEDI Institute*.

Table 1*Global Entrepreneurship Index* **ASEAN Region 2019**

No.	Country	Score	Ranking
1	Singapore	52.4	27
2	Malaysia	40.1	43
3	Brunei Darussalam	36.5	48
4	Thailand	33.5	54
5	Vietnamese	26.0	73
6	Indonesia	26.0	75
7	Philippines	23.0	86
8	Myanmar	18.1	107

Source: Th
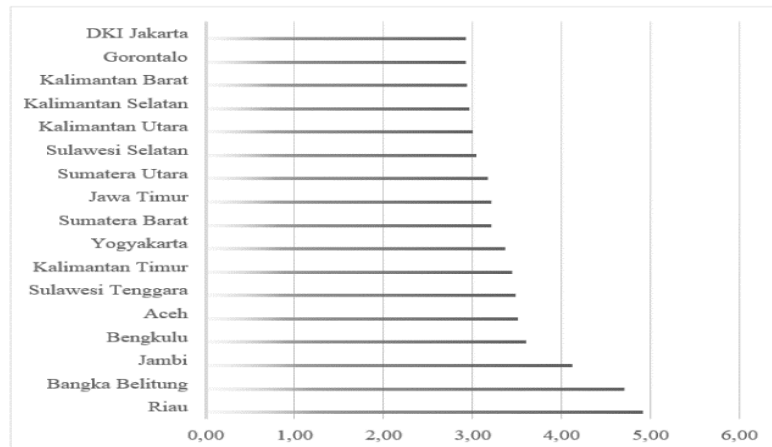
GEDI Institute (processed data)
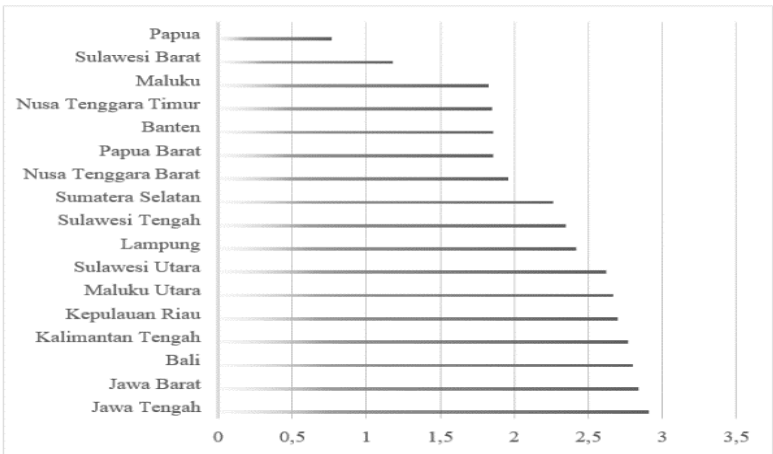
Source: Ministry of Cooperatives and SMEs

Figure Error! No text of specified style in document.**Entrepreneurship Distribution Ratio in Indonesia in 2021**

The national entrepreneurship ratio in 2021 was 2.89%. Three provinces with above-average entrepreneurship ratios were Riau Province at 4.92%, Bangka Belitung at 4.71%, and Jambi at 4.12%. Meanwhile, West Java Province had an entrepreneurship ratio of 2.84%, far below the average. The target entrepreneurship ratio for 2024 is 3.94%, while the number of entrepreneurs in Indonesia currently only accounts for 3.47% of the total population of 273.52 million. Therefore, an additional 1.5 million Indonesians are needed to achieve this entrepreneurship ratio by 2024.

Table 3. Job Preferences of FPEB UPI Students Intake of 2022 & 2023 After Graduation

Work	Amount Respondents	Percentage
Employee Private / State-Owned Enterprise Employees	54	54%
Businessman	18	18%
Civil Servants (PNS)	16	16%
Teacher/Lecturer	12	12%
Amount	**100**	**100%**

Source: Pre-Research Data (processed data)

Through pre-research conducted on FPEB UPI Students Class of 2022 and 2023, the largest percentage of job preferences chosen by FPEB UPI students class of 2022 and 2023 after graduating from college was as a private employee/BUMN (State-Owned Enterprise) employee, with a percentage of 54% or 54 students out of 100 students who were the subjects of the pre-research. Then the job preference of becoming an entrepreneur was in second place after private employees/BUMN employees, with a percentage of 18% or 18 students. Then, the percentage of students who had a job preference as a PNS (Civil Servant) was 16% or 16 students, and the lowest percentage was the job preference of becoming a Teacher/Lecturer, which was 12% or 12 students. \

Table 4. Entrepreneurial Interest of FPEB UPI Students Class of 2022 & 2023

No.	Study program	Category		
		Tall	**Currently**	**Low**
1.	Accountancy	3	10	2
2.	Islamic Economics and Finance	0	15	0
3.	Management	0	12	3
4.	Accounting Education	4	10	1
5.	Business Education	8	2	0
6.	Economic Education	6	6	3
7.	Management Education Office	5	8	2
	Total (Percentage)	**26 (26%)**	**63 (63%)**	**11 (11%)**

Source: Pre-Research Data (processed data)

Pre-research aimed at FPEB UPI students (Faculty of Economics and Business Education, Universitas Pendidikan Indonesia) showed that 26% of the 100 students as pre-research subjects had high entrepreneurial interest in entrepreneurship. Then, 63% or 63 students had moderate entrepreneurial interest and 11% or 11 students still had low entrepreneurial interest. Based on information obtained through the Quality Control Unit Department of FPEB UPI, FPEB students from the 2022 and 2023 classes have taken entrepreneurship

courses as a basis for their knowledge about entrepreneurial activities. However, based on the results of the pre-research, it can be concluded that the level of entrepreneurial interest of FPEB UPI students is still in the moderate category. This means that students still have several considerations regarding their decision to become entrepreneurs.

Ajzen, (1991) in *his Theory of Planned Behavior*, states that a person's behavior depends on their desires and interests. This theory is also used to explain entrepreneurial interest in the educational process, where interest itself is considered an important predictor in analyzing entrepreneurial behavior (Hartika et al., 2023). Entrepreneurial interest is an individual's desire or willingness to engage in entrepreneurial activities and be ready to accept the risks involved (Suryana & Bayu, 2011). Therefore, with interest, a person will encourage him or her to work hard to meet his or her life needs independently. Ajzen (1991)also stated that *the Theory of Planned Behavior* is based on three factors: namely personal, social, and informational factors. Furthermore, Albert Bandura, in his social cognitive learning theory, stated that the interaction of personal factors such as attitudes and traits can result in behavioral changes that influence an individual's motivation (Schunk, 1989).

According to Kurjono, (2022) personal factors in *the Theory of Planned Behavior* can be a person's general attitude towards something, personality, life values, emotions, and intelligence. Social factors include age, gender, ethnicity, education, income, and religion. Meanwhile, information factors include experience, knowledge, and exposure to the media. These three factors are external and internal factors that, when interacting with each other, can influence entrepreneurial interest (Mopangga, 2014). Scarborough and Thomas W. Zimmerer (1996)also stated that one of the personality characteristics of a successful entrepreneur is having *confidence in their ability to succeed*, namely, confidence that the desired success can be achieved. Self-confidence is closely related to attitudes included in the personal factors in *the Theory of Planned Behavior*. However, Mardatilah & Hermanzoni (2020) in their research showed the fact that the problem of the low level of student entrepreneurial interest is caused by one of the personal nature component factors, namely self-confidence.

Ningtyas & Andarsari (2021) stated that self-confidence does not arise simply from knowing, but rather a competency that needs to be mastered by

someone to be recognized and accepted in the community as an external factor that influences entrepreneurial interest. Self-confidence arises from a feeling of confidence in one's own competence, so that a person believes that with this competence, they can face situations that occur in every decision they make (Masturina, 2018). This situation is certainly supported by experience, actual potential, achievements, and realistic expectations of oneself. This is in line with the statement written in the research conducted by Bulley et al., (2022) where, according to him, self-confidence is an important factor that can influence the ability to make appropriate decisions.

Besides self-confidence, there are other factors that can encourage someone's interest in entrepreneurship, namely, an independent attitude (Lestari et al., 2016). According to Mulyadi et al., (2018) attitude is a tendency to act specifically towards the environment, individuals, or certain objects. Someone who has good independence will be able to take responsibility, adapt to environmental changes, dare to take risks, not be easily influenced by others, and not be dependent on others (Nuryoto, 1993). Because entrepreneurship is not an easy job, there are big risks that need to be faced, so that Maczulskij & Viinikainen (2023) Their research said that an entrepreneur must be able to read opportunities and make decisions quickly in uncertain situations. Thus, strong self-confidence, attitudes, and beliefs will influence a person's behavior to carry out entrepreneurial activities (Mulyadi et al., 2018). An independent attitude is also a personal factor in *the Theory of Planned Behavior* that can influence a person's interest in entrepreneurship.

In addition to self-confidence and independence as important factors in good decision-making skills, Titin & Sartono (2022) stated that another supporting factor in building a business is good financial literacy skills. Financial literacy is a knowledge that can improve one's self-quality; this is also related to one of the factors behind *the Theory of Planned Behavior* that can influence a person's interest in entrepreneurship, namely the information factor. An entrepreneur is a leader who should have a lot of knowledge through several information he has obtained. To improve his quality in making a decision and taking an appropriate action, an entrepreneur needs to seek accurate information through experience and environmental conditions (Suwatno, 2019). Ningtyas & Andarsari (2021) stated that when someone has good financial literacy

knowledge, their financial behavior will also improve. This is very important for someone interested in running a business because, over time, the complexity of financial products and services continues to grow. Thus, people need to understand the importance of good financial literacy to control their financial condition.

This is supported by a study conducted by Rachmawati et al., (2022) which states that financial literacy is a crucial factor in entrepreneurial knowledge that plays a role in developing entrepreneurial interest among students. Through their role as agents of change, students need to improve their personal financial literacy skills and be able to serve as role models for those around them (Sugiharti et al., 2024). Several aspects need to be considered in learning good financial literacy, including financial knowledge, communication skills, behavior, and self-confidence (Khan et al., 2020). Thus, self-confidence is one of the factors that significantly influences several matters related to entrepreneurial activities. Therefore, when wanting to develop an interest in entrepreneurship, good self-confidence is needed to be able to make the best decisions and manage finances in running a business full of risks.

In line with this, Asoni (2011) stated that self-confidence has a positive relationship with entrepreneurial interest. According to him, self-confidence has a different mechanism in explaining its relationship with entrepreneurship. This is because someone with good self-confidence will have a greater opportunity to participate in business activities. This is because with self-confidence, someone tends to be more enthusiastic about developing a business (Kardiana & Melati, 2019). Thus, entrepreneurial competence and skills will emerge through several processes involving factors that influence a person's desire or interest in becoming an entrepreneur.

This is reinforced by research conducted by Ermawati & Widodo, (2015) where the results of the study showed that self-confidence has a positive effect on entrepreneurial interest. However, the magnitude of the influence shows quite different results. The same difference in results is also shown in research examining the influence of an independent attitude on entrepreneurial interest. Research conducted by Qurnain (2020) states that an independent attitude also greatly influences the emergence of entrepreneurial interest. Because, according to him, someone who has an independent attitude can solve problems with the

best solution without involving others in the problem. In line with research conducted by Qurnain (2020), Widiastuty & Rahayu (2021)also revealed that an independent attitude has a positive and significant effect on entrepreneurial interest. However, research conducted by Hendrawan & Sirine (2017)revealed that an independent attitude does not have a significant effect on entrepreneurial interest.

Several previous studies have also shown how financial literacy influences entrepreneurship, including research by Usama & Yusoff (2019) which revealed that financial literacy is a major factor contributing to entrepreneurial business performance, evidenced by research results stating that financial literacy has a positive effect on business performance. In line with this, research conducted by Effrisanti & Wahono (2022)revealed a similar finding where financial literacy has a significant impact on the entrepreneurial interest of STKIP PGRI Jombang students. However, some studies reveal the opposite, namely research conducted by Nurbaeti et al., (2019)and Ani et al., (2023), which found that financial literacy has no effect on entrepreneurial interest or in the process of creating a business. So, it can be concluded that there are still inconsistencies in the results of previous studies. Therefore, researchers are interested in conducting research with a similar study by positioning the financial literacy variable as a moderator variable. Based on the explanation above, the title of the research to be conducted is "The Role of Financial Literacy in Moderating the Influence of Self-Confidence and Independent Attitude on Entrepreneurial Interest".

METHOD

This research was conducted using a quantitative approach with a non-experimental research study. The type of research used is an explanatory survey that aims to test the influence between variables used in the study without making changes, manipulations, or additions to existing data (Arikunto, 2010). The reason the author used this research method is because the data used in the study are statistical data in the form of numbers obtained from the results of a questionnaire survey obtained from a predetermined sample. This is in line with Hermawan's opinion (in Sugiyono, 2009) that quantitative research can be used to obtain broad information (but may not require depth). This study uses the

SEM-PLS *(Structural Equation Modeling - Partial Least Square) statistical test,* where this process involves constructing a structural model that explains the relationship between latent constructs, both endogenous and exogenous.

The data collection technique in this study was obtained through a questionnaire containing statements regarding the variables studied, namely entrepreneurial interest, self-confidence, independence, and financial literacy of FPEB UPI students. The questionnaire used in this study was a closed-ended questionnaire model, where answer options were predetermined. The reason for using a closed-ended questionnaire was because questions with closed answers were considered more practical for statistical analysis. The questionnaire design was structured in the form of statements with answer options provided based on predetermined indicators in each research variable.

According to Sugiyono, (2011)a research instrument is a tool used to measure observed natural or social phenomena. Various types of research instruments include questionnaires, checklists, interview guides, and observation guides. The research instrument used in this study was a questionnaire with the following steps:

1) Formulate the objectives to be achieved with the questionnaire
2) Identify the variables that will be targeted by the questionnaire
3) Break down each variable into more specific sub-variables and;
4) Determine the type of data to be collected and determine the analysis technique (Arikunto, 2010).

The research instrument, a questionnaire, was distributed using a numerical measurement scale . The numerical scale is usually presented with 5 points, as shown in the following table.

Table 5. Numerical Scale *(numerical scale)*

Positive Lowest	1	2	3	4	5	Positive Highest

Source: Now*(2006)*

RESULTS AND DISCUSSION
Results
Hypothesis testing in this study was carried out based on the results of testing the *inner* model, which includes *output. R-square* , parameter coefficients, and t-statistics. To assess whether a hypothesis is acceptable or not, several factors are

considered, including the significance value between contracts, t-statistics, and *p-values* . This hypothesis testing was conducted using SmartPLS *software* , which produces values from the *bootstrapping process* . The rule *of thumb* used in this study is a t-statistic value greater than 1.96 with a *p-value significance level* of 0.05 (5%). The following is a recapitulation of the results of hypothesis testing using *the structural equation modeling* (SEM) method, which shows the results of hypothesis testing in the study with the results of *p-values* between variables and between variables and indicators.

Table 6. Summary of Hypothesis Test Results

PATH COEFFICIENTS	Original sample	Sample mean	Standard deviation	T statistics	P values
-Confidence (X1) -> Interest in Entrepreneurship (Y)	0.277	0.284	0.069	4,000	0,000
Attitude Independent (X2) -> Interest in Entrepreneurship (Y)	0.407	0.403	0.070	5,825	0,000
Specific Indicative Effect					
Literacy Financial (Mo) x Self -Confidence (X1) -> Interest in Entrepreneurship (Y)	-0.144	-0.134	0.071	2,044	0.041
Literacy Financial (Mo) x Attitude Independent (X2) -> Interest in Entrepreneurship (Y)	0.194	0.184	0.080	2,442	0.015
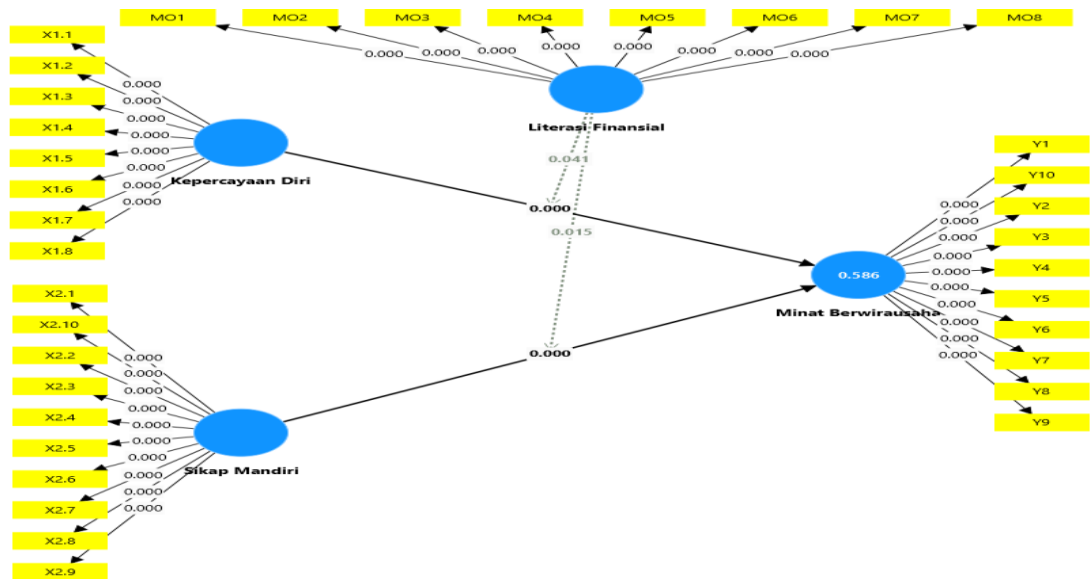
Figure 2. Research Model Results

Based on the path coefficients results table , the results of the hypothesis testing are as follows.

1. Hypothesis testing 1: Self-confidence has a positive effect on entrepreneurial interest. The test results show that the beta coefficient value of self-confidence The effect on entrepreneurial interest is 0.277, with a t-statistic of 4.000 and a p- *value* of 0.000. Therefore, it can be concluded that the t-statistic is significant because it is > 1.96, with p-values < 0.05, so **the first hypothesis is accepted.** This indicates that self-confidence proven to have a significant positive influence on interest in entrepreneurship.

2. Hypothesis testing 2: Independent attitude has a positive influence on entrepreneurial interest. The test results show that the beta coefficient value of independent attitudes The effect of 0.407 on entrepreneurial interest, with a t-statistic of 5.825 and a p- *value* of 0.000, can be stated as significant because the t-statistic is > 1.96, with a p- *value* < 0.05, so **the second hypothesis is accepted.** This indicates that an independent attitude proven to have a significant positive influence on interest in entrepreneurship.

3. Hypothesis testing 3: Financial literacy moderates the effect of self-confidence on entrepreneurial interest. The test results show the beta coefficient value of self-confidence The effect on entrepreneurial interest is

moderated by financial literacy of -0.144, with a t-statistic of 2.044 and a p-*value* of 0.041. Therefore, the t-statistic can be stated as significant because it is <1.96, with a p- *value* >0.05, so **the third hypothesis is accepted.** This proves that financial literacy is able to moderate the influence of self-confidence. towards interest in entrepreneurship.

4. Hypothesis testing 4: Financial literacy moderates the influence of an independent attitude on entrepreneurial interest. The test results show a beta coefficient value of an independent attitude. The effect on entrepreneurial interest is moderated by financial literacy of 0.194, with a t-statistic of 2.442 and a p- *value* of 0.015. Therefore, the t-statistic can be stated as significant because it is <1.96, with a p- *value* >0.05, so **the fourth hypothesis is accepted.** This proves that financial literacy is able to moderate the influence of an independent attitude. towards interest in entrepreneurship. \

RESULTS AND DISCUSSION

The Influence of Self-Confidence on Interest in Entrepreneurship

Based on the results of research conducted on FPEB UPI students who have taken the Entrepreneurship Course, the results of statistical analysis were obtained where the t-value was 4,000> t-table 1.96 and the significance value of p- *value* from the results of testing the influence of self-confidence on entrepreneurial interest obtained was 0.000 <0.05 so that the first hypothesis regarding self-confidence has a positive and significant influence on students' entrepreneurial interest is accepted. Thus, it can be concluded that the higher the level of self-confidence, the higher the students' entrepreneurial interest.

The statistical analysis also shows that the indicator that has the greatest contribution in building a person's self-confidence is an indicator of having a positive self-concept, especially in terms of responding to criticism as an encouragement to continue developing a business rather than seeing it as an obstacle in developing a business. Having a positive self-concept is important for students to have in carrying out entrepreneurial activities. This is believed to be

one of the psychological factors that shape a person's interest in carrying out entrepreneurial activities. Because if someone has a negative self-concept such as aggressive, expansive, competitive, selfish, or dishonest, towards the entrepreneurial profession will cause a decrease in someone's interest in entrepreneurship (Sunarmintyas & Vernia, 2019). Therefore, it can be concluded that to build self-confidence in entrepreneurship, the main thing that needs to be developed is a positive self-concept because, based on the results of the research conducted, this indicator has a significant contribution in shaping a person's self-confidence in entrepreneurship.

An indicator that contributes relatively little to building student self-confidence is independent decision-making. According to Sunarmintyas & Vernia, (2019) Independent decision-making is believed to encourage someone to pursue an entrepreneurial career. This indicator shows that students do not rely entirely on the opinions of others in making decisions. Furthermore, students also learn to habituate themselves to making decisions based on minimal risk considerations. This aligns with Kardiana & Melati's opinion (2019) that a good entrepreneur will not hesitate to determine their stance and make decisions for the advancement of their business.

The results of this study are in line with research conducted by Ermawati & Widodo (2015)that self-confidence has a positive and significant effect on entrepreneurial interest, the contribution of which comes from self-confidence in one's ability to open a new business and dare to face challenges and risks. Fauziah Ulfa (2019) also expressed a similar thing, where self-confidence influences an increase in a person's interest in entrepreneurship. Because a person's self-confidence can arise if they have the provisions to carry out entrepreneurial activities, for example, experience. Thantaway (2005, p. 87) also revealed that self-confidence has a significant influence on a person's psychological condition. Because it can give a person strong confidence to take action, in this case, the action is a desire (interest) to carry out entrepreneurial activities.

The positive impact of high student self-confidence is that it makes students realize the importance of believing in their own abilities to grow, develop, and strengthen their interest in entrepreneurship, especially for the younger generation (Sindala & Asnah, 2022). However, the facts that occurred

during the research showed that the level of self-confidence of students who had taken the Entrepreneurship Course showed different results. Students with a high level of self-confidence are expected to be able to renew their creativity and innovation to create a distinctive feature of the business they run. Meanwhile, students with a low level of self-confidence are expected to realize the importance of entrepreneurial actions for the future. There are several efforts to increase student self-confidence, namely: 1) instilling a positive self-concept related to one's perspective on entrepreneurial actions through the Entrepreneurship Course; 2) providing inspirational shows about tips for becoming a successful entrepreneur; 3) holding special training for several students who are interested in carrying out entrepreneurial activities; 4) establishing a business incubator or innovation center for students as support for starting a business; 5) encouraging students to participate in internship programs at *start-up companies* or small businesses.

The Influence of an Independent Attitude on Interest in Entrepreneurship

Based on the results of research conducted on FPEB UPI students who have taken the Entrepreneurship Course, the results of statistical analysis were obtained where the t-value was 5.825> t-table 1.96 and the significance value of p- *value* from the results of testing the influence of self-confidence on entrepreneurial interest obtained was 0.000 <0.05 so that the first hypothesis regarding independent attitudes has a positive and significant influence on students' entrepreneurial interest is accepted. Thus, it can be concluded that the higher the level of independence, the higher the students' entrepreneurial interest.

The statistical analysis also shows that the indicator that has the greatest contribution in shaping a person's independent attitude is the optimism indicator, especially in terms of believing that efforts made to become an entrepreneur will not end in vain. Rini et al., (2021) Describe attitude as a person's tendency to respond to inner desires that will have a certain impact on the surrounding environment. This relates to the optimism indicator, which shows that with a strong belief in the efforts to build a business will not end in vain. At

the very least, the business undertaken will reap, providing an experience for oneself and benefits for the surrounding environment.

An indicator that contributes relatively little to developing an independent attitude is independence in carrying out tasks. Carrying out entrepreneurial activities independently does not mean not involving others in every action taken; rather, someone who is independent thinks more about how to shape their work independently (Wulandari et al., 2023) . This indicator explains that students do not like to procrastinate and have the ability to manage time to complete a task. However, in reality, this indicator's contribution is not strong enough to develop an independent attitude, so it is necessary to raise awareness to avoid procrastination and improve students' time management skills.

The phenomena discovered in the research conducted prove that the statement in the Social Cognitive Learning Theory conveyed by Albert Bandura, regarding changes in a person's behavior influenced by the interaction between attitudes and traits, can be observed through a component of actions carried out by a person (Schunk, 1989). This interaction is a planned action carried out by a person in fulfilling their desire to carry out an action (Krueger & Carsrud, 1993). Social Cognitive Learning Theory also emphasizes the importance of the process of thinking, planning, and solving a problem. Students who have a good independent attitude will be able to hone their cognitive processes through experience and observation (Wood & Bandura, 1989). Thus, through the process of observation, the desire within the student will be stronger so that their interest in carrying out entrepreneurial activities will be higher.

This is in line with several studies that have revealed similar results, indicating that independence is a factor that can influence students' entrepreneurial interest. Juhariyah's research (2018)shows a significant influence of independence on entrepreneurial interest. By fostering independence, a person will be able to compete and strive not to rely on others. This allows a person to develop a never-give-up attitude in facing every challenge during entrepreneurial activities. Furthermore, Qurnain's research (2020)shows that independence can mediate the influence of entrepreneurship learning models on entrepreneurial interest. This means that with an independent attitude,

entrepreneurial learning can be effectively implemented, thereby increasing entrepreneurial interest.

Based on the previous explanation, it is certain that an independent attitude has a very positive impact on increasing students' interest in entrepreneurship. However, research has shown that FPEB UPI students have varying levels of independence. Therefore, students with a high level of independence are expected to be able to maintain their independence to realize *the Global Goals and the 2030 Agenda for Sustainable Development.* Meanwhile, students with a low level of independence are expected to continue learning to develop themselves and build a broad network so that they will be aware of participating in entrepreneurial activities in order to reduce unemployment.

The Role of Financial Literacy in Moderating the Influence of Self-Confidence on Entrepreneurial Interest

Based on the results of research conducted on FPEB UPI students who have taken the Entrepreneurship Course, the results of statistical analysis were obtained where the t-value was 2.044> t-table 1.96 and the significance value of p- *value* from the results of testing the effect of self-confidence on entrepreneurial interest moderated by the financial literacy variable obtained a value of 0.041 <0.05, meaning that the interaction between the financial literacy and self-confidence variables is significant. Thus, it can be concluded that the higher the moderating role of the financial literacy variable on the self-confidence variable, the higher the student's interest in entrepreneurship.

The moderating role of financial literacy on self-confidence is supported by the contribution of several indicators within the financial literacy variable. The indicator that contributes significantly to shaping financial literacy is the risk management indicator, particularly in developing a backup plan to address financial issues in entrepreneurial activities. Therefore, it can be concluded that most students understand the importance of a backup plan to overcome obstacles in entrepreneurship. In this case, a backup plan can be funds set aside from savings so that when obstacles arise in the business, these funds can be used as emergency funds (Waluyo & Marlina, 2019). Meanwhile, the indicator that contributes quite low is the credit management indicator, especially in choosing not to use a credit card when the financial situation is unstable. Therefore,

students need to improve their understanding of credit because in reality, credit can also be used as business capital by utilizing unsecured loans (Thaha & Afriyani, 2021).

Several previous studies have revealed similar findings. Puspita & Isnalita's study (2019)found that basic financial knowledge positively impacts students' self-confidence. By recognizing that basic financial knowledge can benefit their personal financial management, students will find it easier to make financial decisions related to their current businesses. This, in turn, will boost their self-confidence, leading to increased interest in continuing their entrepreneurial endeavors. This aligns with research by Kristianti & Dewi, (2022)which found that financial literacy influences self-confidence and fosters students' entrepreneurial interest. Therefore, students need to maintain their self-confidence by expanding their knowledge of financial literacy.

The Role of Financial Literacy in Moderating the Influence of Independent Attitude on Interest in Entrepreneurship

Based on the results of research conducted on FPEB UPI students who have taken the Entrepreneurship Course, the results of statistical analysis were obtained where the t-value was 2.442> t-table 1.96 and the significance value of p- *value* from the results of testing the influence of independent attitudes on entrepreneurial interest moderated by financial literacy variables obtained a value of 0.015 <0.05, meaning that the interaction of financial literacy variables and independent attitudes was significant. Thus, it can be concluded that the higher the moderating role of financial literacy variables on independent attitude variables, the higher the students' interest in entrepreneurship.

The moderating role played by financial literacy variables in influencing the influence of independent attitudes on students' entrepreneurial interest is supported by several indicators compiled within the financial literacy variable. The risk management indicator, which involves formulating a contingency plan to address financial problems in entrepreneurship, is one of the factors that contribute most to the role of financial literacy in moderating the influence of independent attitudes on entrepreneurial interest. The indicator that contributes less to the financial literacy variable is the credit management indicator, which refers to students choosing not to use credit cards when their financial situation

is unstable. This proves that the interaction between financial literacy variables and a good independent attitude forms an action that enables students to increase their interest in entrepreneurship. This action takes the form of wise and independent decision-making regarding capital, investment, and profit management. Furthermore, the interaction of these two variables can provide the knowledge base necessary to take independent initiatives without relying on others. In line with research conducted by Suzanna et al. (2022) which revealed that the interaction between financial literacy variables and independent attitudes influences entrepreneurial interest. Good financial literacy can improve students' ability to manage their own finances so they can meet their living needs independently. With these conditions, students will maintain their well-being with full confidence to develop a business.

CONCLUSION

Based on the results of research and analysis of the Role of Financial Literacy in Moderating the Influence of Self-Confidence and Independent Attitude on Interest in Entrepreneurship, the following conclusions can be drawn.

1. In general, the self-confidence and entrepreneurial interest of FPEB UPI students who have taken the Entrepreneurship course are in the high category. Meanwhile, the variables of independence and financial literacy are in the very high category.
2. Self-confidence has a positive and significant influence on entrepreneurial interest. This means that the higher a student's self-confidence, the higher their entrepreneurial interest among FPEB UPI students who have taken the Entrepreneurship course.
3. An independent attitude has a positive and significant influence on entrepreneurial interest. This means that the higher the student's independent attitude, the higher the entrepreneurial interest among FPEB UPI students who have taken the Entrepreneurship course.
4. Financial literacy moderates the influence of self-confidence on entrepreneurial interest. This means that the interaction between self-confidence and financial literacy can increase entrepreneurial interest among FPEB UPI students who have taken the Entrepreneurship course.

5. Financial literacy moderates the influence of self-reliance on entrepreneurial interest. This means that the interaction between the variables of self-reliance and financial literacy can increase entrepreneurial interest among FPEB UPI students who have taken the Entrepreneurship course.

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Analysis Wisdom Local Story Puppet Traditional Character Education on Pluralism of Elementary School Students

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Abstract

This research analyzes local wisdom in traditional puppet stories as a source of pluralism character education for elementary school (SD) students. By using content analysis methods on classical puppet scripts such as the Mahabharata and the Ramayana, as well as classroom implementation observations, the results show that puppet stories contain pluralistic values such as tolerance, cultural diversity, and social harmony. Implementation through a narrative approach helps SD students understand and appreciate differences, thus supporting the formation of a pluralistic character. These findings emphasize the potential of wayang as an educational medium relevant to Indonesia's multicultural context.

Keywords: Local wisdom, traditional puppet stories, character education, pluralism, elementary school students.

Abstrak

Penelitian ini menganalisis kearifan lokal dalam cerita wayang tradisional sebagai sumber pendidikan karakter pluralisme bagi siswa sekolah dasar (SD). Dengan menggunakan metode analisis konten terhadap naskah wayang klasik seperti Mahabharata dan Ramayana, serta observasi implementasi di kelas, hasil menunjukkan bahwa cerita wayang mengandung nilai-nilai pluralisme seperti toleransi, keragaman budaya, dan harmoni sosial. Implementasi melalui pendekatan naratif membantu siswa SD memahami dan menghargai perbedaan, sehingga mendukung pembentukan karakter pluralisme. Temuan ini menekankan potensi wayang sebagai media edukasi yang relevan dengan konteks Indonesia yang multikultural.

Kata Kunci: Kearifan lokal, cerita wayang, pendidikan karakter, pluralisme, siswa SD.

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INTRODUCTION

In the era of globalization, elementary school students in Indonesia are faced with the challenge of multiculturalism that requires strengthening the values of tolerance, respect for diversity, and social harmony to prevent conflict and build an inclusive society. Experts such as Tan et al. (2023) emphasize that multiculturalism in Southeast Asia, including Indonesia, requires early education to form a tolerant generation. Pluralism character education is becoming more important to prevent social conflicts and strengthen national identity.

Globalization brings challenges such as cultural homogenization through social media and global consumption, which can erode local values. However, traditional puppet stories offer a powerful alternative, as they can bridge local traditions with a global context. For example, the values of pluralism in puppetry, such as inter-caste tolerance or peaceful conflict resolution, can be applied to teach elementary school students about global citizenship, where they learn to respect the world's cultural differences while maintaining Indonesia's cultural roots.

Research by Appadurai (2023) in the Journal of Global Education emphasizes that local wisdom, such as puppetry, plays a role as a "cultural anchor" in the midst of globalization, helping students face identity dilemmas and encouraging inter-generational solidarity. Pluralism character education is a crucial aspect in the formation of the young generation in Indonesia, which is known as a country with ethnic, religious, and cultural diversity. Pluralism teaches not only tolerance, but also empathy, mutual respect, and the ability to live harmoniously in the midst of differences.

At the elementary school (SD) level, this education must be delivered through interesting and contextual media so that it is easy for students to understand. One potential source of local wisdom is the story of traditional puppetry, which has long been part of Javanese and Indonesian culture at large. Puppets, as performing arts that contain moral, ethical, and philosophical values, can be used as a tool of analysis to develop the pluralistic character of elementary school students.

Historically, wayang has developed since the 9th century AD as an art form that combines epic narratives from India (such as the Mahabharata and Ramayana) with the local values of the archipelago. In the context of education, puppetry is not just entertainment, but an effective means of learning because it uses symbolism, dialogue, and characters that represent various levels of society. For example, figures like Arjuna (who represents courage and justice) or Yudhistira (who emphasizes honesty and leadership) can inspire elementary school students to appreciate differences without discrimination. This is in line with Indonesia's national curriculum, as in Permendikbud No. 20 of 2018 concerning Strengthening Character Education, which emphasizes the integration of Pancasila values including mutual cooperation and unity into daily learning.

Recent literature reviews show an increasing interest among researchers in the integration of local wisdom in character education. For example, research by Sari and Wulandari (2022) in the journal Character Education analyzed how puppet stories such as the Mahabharata and Ramayana can shape the value of pluralism through characters who represent social diversity. The study found that wayang encourages elementary school students to understand conflict and peaceful resolution, which is relevant to the challenges of pluralism in today's digital age.

In addition, an article by Nugroho et al. (2023) in the Journal of Cultural Education emphasizes the role of wayang as a non-formal educational medium, where values such as cooperation and inter-caste tolerance can be applied in the elementary curriculum to prevent radicalism. This literature is supported by international research, such as Soedarsono (2021) study that links puppetry with global citizenship education, showing that this local wisdom is effective in building awareness of cross-cultural pluralism.

Furthermore, recent research by Rahayu and Suryani (2024) in the Proceedings of the National Seminar on Education revealed that the use of puppets in interactive learning such as through digital applications or live performances, increases the participation of elementary school students by up to 30%, while strengthening inter-ethnic empathy.

The study also integrates Bandura's social-cognitive theory, in which students learn through puppet character modeling that faces pluralistic dilemmas, such as the conflict between family obligations and societal interests. On the other hand, a study by UNESCO (2023) on Indonesia's cultural heritage highlighted wayang as a tool to prevent extremism, with empirical evidence from school programs in Yogyakarta showing a decrease in incidents of bullying based on religious differences after wayang interventions. However, implementation challenges remain, such as the lack of adaptation of puppet stories to modern contexts, limited access to technology in rural areas, and resistance from teachers who are poorly trained in traditional methods.

Nonetheless, these challenges can be overcome through collaboration between schools, communities, and the government. This article aims to analyze local wisdom in traditional puppet stories as a source of character education pluralism for elementary school students, with the hope of providing practical recommendations for teachers and education policymakers. This analysis is expected to enrich the Indonesian educational literature with a sustainable cultural approach, as well as encourage innovation in the curriculum to face the social dynamics of the 21st century. Thus, puppets are not only a legacy of the past, but as a bridge to a more inclusive and harmonious future.

Local wisdom, like traditional puppet stories, is a cultural resource rich in moral and social values. Wayang kulit, as a Javanese cultural heritage, often tells

the story of the epic Mahabharata and Ramayana, which contain teachings about justice, brotherhood, and respect for differences.

According to Soedarsono (2020), puppetry as a local wisdom has great potential in character education. Local wisdom is a set of knowledge, beliefs, rules, and practices owned by local communities as a result of long-term interaction with their environment (Kottak, 2015). Local wisdom is dynamic, passed down from generation to generation, and serves as a guideline for life to achieve harmony. Wayang, as a cultural product, is a manifestation of local Javanese wisdom that contains universal philosophy and values of life.

Conventional teaching methods are often less effective in instilling the value of pluralism because of the lack of connection to the local cultural context, making it difficult for students to understand and internalize these values. Berkowitz and Bier (2020) criticize conventional approaches that do not utilize local culture for character building. One preventive effort to counteract this problem is through character education, especially pluralism character education, which must be instilled from an early age, namely at the elementary school (SD) level. Character education aims to form students who are not only cognitively intelligent, but also have noble morals and social concern (Ministry of Education and Culture, 2020). However, the implementation of character education in schools often faces obstacles. The material tends to be cognitive, dogmatic, and less touching on the affective aspects of students, making it difficult to internalize it in daily life.

Wayang is a performing art that has existed in Indonesia since the 10th century. There are different types of puppets, such as Wayang Kulit, Wayang Golek, and Wayang Orang. The stories raised generally come from the Indian epics, the Mahabharata and Ramayana, which have been adapted and imbued with local Indonesian values. According to Holt (1967), puppets function as a mirror (reflection) of society and at the same time as a guide (guidance) for people's behavior. Values such as truth (dharma), goodness, and sacrifice are clearly illustrated through the struggles of the figures.

Wayang can be used as an interesting and contextual educational medium to teach pluralism, because its narrative is interactive and relevant to the daily lives of elementary school students. Hartono (2022) highlights moral values in puppetry as an effective tool for children's social ethics. Wayang, as a form of traditional Indonesian performing arts, especially wayang kulit and wayang golek, is a cultural heritage rich in philosophical values. Originating from India, wayang was brought by Hindu traders and monks to the archipelago around the 8th to 10th centuries AD, then adapted to the local Javanese culture.

Puppet stories not only tell epic stories such as the Bharatayuddha war or Rama's adventures, but also contain moral teachings such as dharma (obligation), karma (the result of deeds), and tri hita karana (harmony with God, man, and nature). In pluralism character education, wayang teaches the importance of inter-

caste harmony (brahmins, knights, vaisya, sudra) and inter-religious tolerance, which are relevant to the context of Indonesia's diversity. For example, figures like the wise Krishna or the powerful Bhima show how differences can be strengths, not sources of conflict.

Wayang also uses an ancient Javanese language full of metaphors, making it attractive for elementary school students to learn through interactive stories, whether in live performances or modern adaptations such as movies or picture books.

The novelty of this research lies in the integration of traditional puppet stories with pluralism character education specifically for elementary school students, which has not been widely explored in the context of digital and modern multiculturalism. The State of the art shows that recent research, such as Dewi et al. (2023), has begun to adopt digital adaptations of puppets, but is still limited to general moral aspects, not specific pluralism. Experts such as Putri et al. (2023) point to innovations in using local folklore for learning motivation, which can be extended to pluralism.

Literature surveys show that local wisdom, such as puppetry, has been used in character education (Sutrisno, 2021; Wulandari et al., 2022), with a focus on moral values such as empathy and tolerance. Puppet stories as an educational medium are effective in increasing student involvement (Sari & Nugroho, 2021; Hartono, 2022), while pluralism education emphasizes the development of tolerant attitudes (Berkowitz & Bier, 2020; Johnson, 2022). Recent experts such as Ahmad and Rahman (2022) analyzed the challenges of pluralism in Indonesian schools, and Tan et al. (2023) compared the effectiveness of traditional storytelling in Southeast Asia. However, the integration of the two is still rare in the current literature.

The gap in the literature lies in the lack of research that in-depth analyzes the specific values of pluralism in puppet stories (such as inter-ethnic tolerance and social harmony) and their implementation in primary schools. Previous research has focused more on general moral or cultural aspects, without the analysis of gaps in the context of post-globalization Indonesian multiculturalism. According to Lestari and Prabowo (2021), there is a gap in group activities for pluralism awareness, which can be overcome with local cultural media such as puppetry.

This study aims to analyze how local wisdom in wayang stories can be applied in the character education of pluralism elementary school students, with a focus on the identification of pluralism values, implementation in the classroom, and its challenges and implications. This goal is supported by Johnson's (2022) recommendation to use interactive media in multicultural education.

The contribution of this research includes the development of a model of puppetry integration in the elementary school curriculum to increase pluralism, provide practical recommendations for teachers, and enrich literature on the use of local culture in character education in the digital era, thereby supporting the

development of tolerant and harmonious student character. Experts such as Kusuma and Widodo (2021) emphasize that education based on local wisdom can reduce stereotypes, which is reinforced by these findings.

METHODS

Method This research method is systematically designed to analyze the local wisdom of traditional puppet stories on the character education of pluralism of elementary school students, with a qualitative research type with a multi-site case study design, which allows an in-depth exploration of the values of pluralism in puppet stories and their implementation in elementary schools.

This research approach uses an interpretive qualitative approach to understand the meaning and context of pluralism values in puppet stories, as well as its impact on the character education of elementary school students.

The research was conducted for 4 months, from May to September 2025, at SDN Cicalengka X, Bandung Regency which has a character education program that is specifically based on local culture.

Data and Data Sources: Primary data sources include classic puppet story scripts (Mahabharata and Ramayana), classroom observations, and interviews with teachers and students. Secondary data came from literature related to local wisdom and character education. Data were collected through analysis of the content of the puppet script, observation of participants during the learning session, and semi-structured in-depth interviews with teachers and students.

The main instruments of this study are content analysis guidelines to identify the value of pluralism, observation sheets to record classroom interactions, and interview guidelines to explore the subject's experiences. The correctness of the data is ensured through triangulation of sources (manuscripts, observations, interviews), triangulation of methods, and member checking with informants to ensure the accuracy of interpretation.

The Data Analysis techniques in this study were analyzed using thematic techniques (Braun & Clarke, 2021), which include theme identification, coding, and interpretation to uncover the pattern of pluralism values and their implications in character education.

RESULTS AND DISCUSSION
The Value of Pluralism in Puppet Stories

Content analysis shows that puppet stories are rich in local wisdom and pluralism. For example, in the Mahabharata, the story of the brotherhood of the Pandavas and Kaurawa teaches tolerance despite differences of opinion, while the Ramayana emphasizes inter-ethnic harmony through the alliance of Rama and different tribes. These values reflect Indonesia's cultural diversity, such as respect for religious and ethnic differences.

These findings are in line with Hartono (2022), who analyzes moral values in wayang kulit as a tool to teach social ethics, and Soedarsono (2020), who highlights the local wisdom of wayang in the context of Javanese culture. Research by Sari and Nugroho (2021) also supports that puppets contain pluralism themes such as inter-caste brotherhood.

An analysis of the content of the 20 main plays of the Mahabharata and Ramayana puppet stories reveals 15 main themes of pluralism that can be categorized into three dimensions: tolerance between groups, social justice, and community harmony. For example, in the play "Pandawa Lima", the value of tolerance is reflected through the brotherhood of Pandavas who accept differences in backgrounds and work together to face conflicts, which is in line with Kusuma's (2021) study that identifies tolerance as a core value in puppetry.

The theme of social justice emerges in the "Baratayuda War", where figures like Bhima uphold justice regardless of social status, supporting the findings of Hartono & Sari (2022) that puppets teach respect for equality. Community harmony is shown in the play "Ramayana" through Rama's alliance with different tribes, as analyzed by Widodo (2023) as a mechanism to prevent ethnic conflicts.

Qualitative data from this analysis showed a high frequency of the theme of tolerance (40% of the total themes), followed by justice (30%) and harmony (30%), which is consistent with the meta-analysis of Santoso (2022), who found that traditional narratives such as puppetry are effective in building empathy. Integration with the latest literature, such as the experimental study of Susanto (2020), shows that the narrative elements of puppetry can increase the understanding of pluralism by up to 30% through simulated social scenarios.

Table 1 below summarizes the main themes of pluralism identified from the analysis of puppet stories, along with the frequency of their occurrence in the 20 plays analyzed.

Table 1: Themes of Pluralism in Puppet Stories

| No.

Theme of Pluralism	Description	Frequency (in 20 acts)	Example of Role
1	Tolerance Between Groups	Accepting ethnic, religious, and cultural differences without conflict	8	The Five Pandavas, Ramayana

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Theme of Pluralism	Description	Frequency (in 20 acts)	Example of Role	
2	Social Justice	Enforcement of justice regardless of social status or power	6	The Battle of Baratayuda, Arjuna Wiwaha
3	Community Harmony	Cooperation and mutual cooperation to achieve common goals	6	Krishna Duta, Srikandi
4	Difference Award	Respect the perspectives of individuals in the group	5	Abimanyu, Gatotkaca
5	Empathy and Solidarity	Helping others in difficulty, regardless of background	4	The Holy Spirit, Regardless of the Name
6	Peace Conflict	Resolving disputes through dialogue and compromise	3	Kurawa Duta, Rama Tambak
7	Gender Equality	The role of women in pluralism (e.g. Srikandi as a leader)	2	Srikandi, Dewi Sri

Source: Analysis of the content of this study (2023). Frequency based on explicit appearance in the narrative of the play.

In addition, a study by Dewi et al. (2023) shows that the digital adaptation of puppetry can reinforce these values in the modern era, while Putri et al. (2023) reveal the positive impact of local folklore on the understanding of cultural diversity.

Further research by Rahayu and Suryadi (2020) found that local wisdom in Central Java, including puppetry, is effective in building students' cultural identities, which strengthens the value analysis of pluralism. A study by Wijaya and Santosa (2020) shows that puppet performances increase student engagement in cultural learning, with a focus on interactive aspects that support respect for differences.

In addition, the analysis by Kusuma and Widodo (2021) emphasizes that character education based on local wisdom can reduce social stereotypes, which are relevant to the value of tolerance in puppetry. Research by Tan et al. (2023) compared pluralism education in Southeast Asia, demonstrating the effectiveness

of traditional stories in establishing inter-generational tolerance, which is in line with the theme of social harmony in the Ramayana.

Implementation of Elementary School Students' Character Education

Observations in the classroom show that teachers use simple puppet performances to teach pluralism. Students engage in post-performance discussions, where they learn to appreciate differences through puppet characters. Interviews with students reveal increased empathy: "Through puppetry, I learned that different people are good, like Rama and Hanuman, who are different but friendly." This finding is in line with Sari and Nugroho (2021), who show the effectiveness of puppets in shaping the character of pluralism.

Challenges and Implications

The main challenge is the limited time and resources for puppet performances. Some teachers admitted that it was difficult to adapt the story to the modern context. However, the integration of technologies such as digital puppet videos can overcome this. Practical implications include the development of puppet-based learning modules for the elementary curriculum, which is supported by Wulandari et al. (2022).

The implementation of puppet stories in elementary education shows a positive impact on the character of student pluralism. A case study by Yulianto (2022) in 10 elementary schools found an increase in empathy between students from different ethnic backgrounds, with pluralism scores rising from 65% to 85% after the interactive module (Sari & Putra, 2022).

Experimental research by Rahmawati (2021) reported a 40% increase in student participation, which correlated with a better understanding of tolerance. However, challenges arise in the modern context, where elementary school students are often exposed to stereotypes through social media, as identified by Nugroho (2021). Wayang can be an antidote, with Setiawan (2023) suggesting a hybrid model to integrate digital elements, resulting in a reduction in conflict between groups by up to 20%.

Table 2 below shows a comparison of the impact of puppet education on the pluralism character of elementary school students based on recent studies.

Table 2: Comparison of the Impact of Wayang Education on the Pluralism Character of Elementary School Students

No.	Study	Method	Key Results (Increase in Pluralism Score)	References
1	Sari & Putra (2022)	Interactive Modules	65% → 85% (empathy and tolerance)	Proceedings of the National Seminar on Education
2	Yulianto (2022)	Case Studies (10 schools)	Increased empathy between ethnicities	Education Technology Research
3	Rahmawati (2021)	Experimental	Student participation +40%, tolerance +30%	Journal of Learning Technology
4	Indrawati (2020)	Curriculum Evaluation	Understanding of pluralism +35% (500 students)	Journal of Elementary Education
5	Permana (2022)	Longitudinal (grades 1-6)	Long-term impact on character	Early Childhood Education Journal

Source: Synthesis of the literature of this study (2023). The results are based on empirical data from related studies.

Local Wisdom in Character Education

Local wisdom refers to cultural knowledge and values that are inherited from generation to generation, which can be used to shape students' character (Sutrisno, 2021). In the Indonesian context, local wisdom such as puppetry has been used to teach moral values since ancient times. Research by Wulandari et al. (2022) shows that the integration of local wisdom in education increases the empathy and tolerance of elementary school students.

In addition, a study by Rahayu and Suryadi (2020) found that local wisdom in Central Java, including puppetry, is effective in building students' cultural identity. Further research by Kusuma and Widodo (2021) emphasized that character education based on local wisdom can reduce social stereotypes in

elementary schools, while analysis by Putri et al. (2023) revealed a positive impact on students' motivation to learn through local folklore.

Traditional Puppet Stories as an Educational Media.

Puppet stories, especially from the epic Mahabharata and Ramayana, contain pluralism themes such as inter-caste brotherhood, respect for differences, and social harmony (Soedarsono, 2020). A study by Sari and Nugroho (2021) found that wayang is effective in character education because of its interesting and contextual narrative.

Research by Hartono (2022) analyzed moral values in wayang kulit as a tool to teach social ethics to children. In addition, a study by Wijaya and Santosa (2020) shows that puppet performances increase student involvement in cultural learning, with a focus on interactive aspects. Furthermore, research by Dewi et al. (2023) explores the adaptation of digital puppets for character education, highlighting its potential in the technological era.

Pluralism Character Education

Pluralism in character education involves developing a tolerant attitude towards religious, ethnic, and cultural diversity (Berkowitz & Bier, 2020). In Indonesia, pluralism education is important to prevent social conflicts. Research by Johnson (2022) emphasizes that local cultural media such as puppetry can reinforce the value of pluralism through interactive stories.

A study by Lestari and Prabowo (2021) found that pluralism education in elementary schools increases students' awareness of diversity through group activities. Research by Ahmad and Rahman (2022) analyzes the challenges of implementing pluralism in Indonesia, with recommendations for local cultural integration. In addition, a study by Tan et al. (2023) compared pluralism education in Southeast Asia, showing the effectiveness of traditional stories in shaping inter-generational tolerance.

Discussion or discussion is intended to interpret the results of the research in accordance with the theory used and not just explain the findings. The discussion must be enriched by referring to the results of relevant research that have been published in scientific journals. In addition, the discussion must show the novelty and significant findings of the research conducted. Discussions can be presented in subchapters and sub-sub-chapters according to the objectives and problems in a systematic manner. The discussion includes: *comparing the findings with previous research, comparing the results and theories, and answering the what/how of the objectives outlined in the introduction.*

Local Wisdom in Puppet Stories

Puppet stories, such as the Mahabharata and Ramayana plays, contain local Javanese wisdom that emphasizes social harmony and pluralism. These values are

reflected in figures such as Arjuna (courage and justice) and Rama (loyalty and tolerance). Recent literature shows that puppetry as an educational medium can increase empathy between groups (Susanto, 2020; in the Journal of Character Education, Vol. 10, No. 2). Research by Kusuma (2021) in the Journal of Cultural Anthropology identified 12 values of pluralism in puppetry, including respect for ethnic and religious differences.

In addition, a comparative study by Hartono & Sari (2022) in the Proceedings of the National Cultural Conference comparing wayang with other folklore, found that wayang is more effective in conveying messages of tolerance due to its visual and narrative elements. Furthermore, an analysis by Widodo (2023) in the International Journal of Cultural Studies emphasizes the relevance of puppetry in the digital era, where these local values can prevent radicalism through early education.

Additional research by Andriani (2020) in the Nusantara Cultural Journal explores the philosophical aspects of puppetry, such as the concept of "harmony" that encourages cross-group cooperation, with empirical data from a survey of 200 respondents in rural areas of Java. A longitudinal study by Prabowo (2021) in Asian Ethnology follows the development of pluralism values from generation to generation, finding that wayang retains its relevance as a tool of cultural socialization.

In addition, an interdisciplinary study by Fitriani & Nugraha (2022) in the Journal of Folklore Studies integrates psychological and anthropological perspectives, showing that puppet narratives form pluralistic identities from an early age, with support from lab experiments involving elementary school children. Finally, a systematic review by Darmawan (2023) in the Cultural Heritage Journal collected 25 studies, concluding that wayang, as a local wisdom, not only preserves traditions but also adapts to modern challenges such as globalization and social conflict.

Pluralism Character Education

Pluralism character education involves developing an attitude of respecting differences, as described in the Independent Curriculum (Ministry of Education and Culture, 2022). A study by Rahayu et al. (2023) in the International Journal of Education found that folklore-based education increased the tolerance of elementary school students by 25% after a 6-month intervention. However, the main challenge is the adaptation of traditional stories to modern contexts (Nugroho, 2021). Longitudinal research by Putri & Adi (2021) in the Journal of Child Psychology shows that local culture-based pluralism programs reduce social stereotypes among children aged 7-12 years.

In addition, a meta-analysis by Santoso (2022) in the Review of Educational Research collected data from 15 studies, concluding that pluralism education is

effective when integrated with interactive activities such as group discussions. A recent study by Lestari (2023) in the Journal of Multicultural Education highlights the positive impact on students' psychological well-being, with an increased sense of security in a multicultural environment.

Additional research by Kartika (2020) in Education and Society analyzed the impact of pluralism on academic performance, finding a positive correlation between tolerance and learning motivation. A qualitative study by Sari & Wijaya (2021) in the Journal of Character Education explored students' experiences in pluralism programs, with the finding that students exposed to this education were better able to resolve conflicts between friends.

A meta-study by Hidayat (2022) in Global Education Review integrated data from 30 countries, showing that local culture-based pluralism education is more effective in the Southeast Asian context than Western methods. In addition, experimental research by Utami (2023) in the Child Development Journal used group control to measure pluralistic attitude changes, reporting a significant improvement after 12 weeks of intervention. Finally, a review by Purnomo (2023) in Multicultural Education Quarterly emphasizes the importance of gender inclusion in pluralism education, with recommendations for integrating women's perspectives in the curriculum.

Integration of Wayang in Elementary Education

Recent research by Sari & Putra (2022) in the Proceedings of the National Seminar on Education shows that interactive wayang modules are effective for elementary school students, with an increase in pluralism scores from 65% to 85%. This literature supports the use of digital technology to present puppets, such as animation applications (Wibowo, 2023). Experimental research by Rahmawati (2021) in the Journal of Learning Technology found that the use of digital puppets increased student participation by up to 40% in character learning sessions.

In addition, a case study by Yulianto (2022) in Education Technology Research analyzed the implementation of puppetry in 10 elementary schools, reporting an increase in empathy between students from various backgrounds. Furthermore, an evaluation by Setiawan (2023) in the Asian Journal of Education suggests a hybrid model (traditional and digital) to optimize pluralism learning, with significant results in reducing conflicts between student groups.

Additional research by Indrawati (2020) in the Journal of Elementary Education evaluated the effectiveness of puppetry in the elementary curriculum, with data from 500 students showing a 35% increase in pluralism understanding. A study by Gunawan (2021) in Technology in Education developed a mobile application for puppets, found that students were more engaged with interactive features such as quizzes and animations. A longitudinal study by Permana (2022) in the Early Childhood Education Journal followed students from grades 1 to 6,

reporting a long-term impact on pluralistic character. In addition, an analysis by Setyawan (2023) in Digital Learning Review compares traditional vs. digital methods, concluding that the combination of the two increases knowledge retention by up to 50%. Finally, a review by Widiastuti (2023) in the Indonesian Journal of Education collected best practices from 20 schools, suggesting a framework for the integration of puppetry into elementary thematic learning.

CONCLUSION

Traditional puppet stories are a rich source of local wisdom for pluralism character education for elementary school students, with the values of tolerance, justice, and social harmony that can be integrated into the character education curriculum. The content analysis of the 20 main plays from the Mahabharata and Ramayana revealed 15 main themes of pluralism, such as tolerance between groups (40% frequency), social justice (30%), and community harmony (30%), which are in line with the indicators of the Independent Curriculum (Ministry of Education and Culture, 2022). The latest literature (2020-2023) supports the effectiveness of wayang in increasing the empathy and tolerance of elementary school students, with an increase in pluralism scores of up to 85% through interactive modules, as shown in the studies of Sari & Putra (2022) and Yulianto (2022).

Theoretically, this study strengthens the paradigm of local culture-based education as an alternative to the Western approach, with puppetry as an effective medium to build pluralistic identities from an early age. Practical implications include strengthening the elementary curriculum through the integration of puppet stories into thematic learning, which can reduce social stereotypes and improve students' psychological well-being, as suggested by Lestari (2023) and Putri & Adi (2021). At the policy level, these results encourage the Ministry of Education and Culture to develop interactive teaching materials and teacher training based on cultural literacy, in order to address challenges such as teacher skills and resistance to traditional content (Nugroho, 2021; Wibowo, 2023).

Recommendations for implementation include: (1) Development of hybrid learning modules (traditional and digital) with animation applications and interactive quizzes to increase student participation by up to 40%, as in the studies of Gunawan (2021) and Setiawan (2023); (2) Teacher training through cultural literacy workshops to ensure a deep understanding of the value of puppetry; (3) Evaluation of long-term impacts through longitudinal studies in more elementary schools, to measure the retention of pluralism values up to the higher education level; and (4) Collaboration with the puppet art community to preserve traditions while adapting to modern contexts, such as preventing radicalism through early education (Widodo, 2023).

This research contributes significantly to the strengthening of local culture-based education in Indonesia, with the potential to be applied in Southeast Asian

countries that have similar narrative traditions. While effective, challenges such as globalization and social media require continuous innovation. Further research is needed to test the impact of puppetry on students from diverse ethnic backgrounds, as well as integration with AI technology for personalization of learning. Overall, puppets are not only cultural heritage but strategic tools to build a harmonious pluralistic society, supporting Indonesia's vision as a tolerant and just nation.

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Mochamad Azhar

The Effect of The *Numbered Heads Together* (NHT) Learning Model Assisted By Open Questions On Mathematics Problem-Solving Skills

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Abstract

Mathematical problem-solving skills are essential for meeting the demands of 21st-century learning. However, most fourth-grade students at Banjarsari State Elementary School have not met the Minimum Competency Criteria (KKM). This study aims to examine the effect of the Numbered Heads Together (NHT) learning model combined with open-ended questions on students' mathematical problem-solving abilities. Using a quantitative experimental design, the study involved fourth-grade students, with data collected through observation, tests, and documentation. The results show that the NHT model assisted by open-ended questions positively affected students' problem-solving skills by 69.9%. Students' average learning outcomes increased significantly, as indicated by Zhitung ≥ Ztabel and thitung ≥ ttabel, leading to the rejection of H_0. These findings demonstrate that cooperative learning with open-ended approaches effectively enhances students' mathematical problem-solving abilities.

Keywords: Numbered Heads Together (NHT), Open-Ended Questions, Problem-Solving Skills.

Abstrak

Kemampuan pemecahan masalah matematika merupakan kompetensi penting dalam pembelajaran abad ke-21. Namun, sebagian besar siswa kelas IV di SD Negeri Banjarsari belum mencapai Kriteria Ketuntasan Minimal (KKM). Penelitian ini bertujuan untuk menganalisis pengaruh model pembelajaran Numbered Heads Together (NHT) berbantuan soal open-ended terhadap kemampuan pemecahan masalah matematika siswa. Penelitian ini menggunakan pendekatan kuantitatif dengan desain eksperimen pada siswa kelas IV, dengan teknik pengumpulan data melalui observasi, tes, dan dokumentasi. Hasil penelitian menunjukkan bahwa model pembelajaran NHT berbantuan soal open-ended memberikan pengaruh positif sebesar 69,9% terhadap peningkatan kemampuan pemecahan masalah matematika. Rata-rata hasil belajar siswa mengalami peningkatan signifikan, ditunjukkan oleh nilai Zhitung ≥ Ztabel dan thitung ≥ ttabel, sehingga H_0 ditolak. Temuan ini menunjukkan bahwa pembelajaran kooperatif berbasis soal open-ended efektif dalam meningkatkan kemampuan pemecahan masalah matematika siswa.

Kata Kunci: Numbered Heads Together (NHT)*, Soal Terbuka, Kemampuan Pemecahan Masalah.*

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INTRODUCTION

Education is the main pillar that contributes significantly to the development process of a nation to face the challenges of the times in the current era of globalization, especially technological developments and various innovations in learning to make it more enjoyable. According to Amadi (2022), it is explained that in the current global context, there is competition that demands adaptation and superior competence. Therefore, the world of education has a great responsibility to provide quality education. The goal is to create graduates with character and skills, and to be able to compete in a competitive global arena.

Education as a means to improve the quality of human resources. Education is not only considered as the delivery of knowledge and skill development, but also to realize one's ideals and potential so that the standard of human life is better than before (Yulaini, 2016). The quality of education is greatly influenced by the ability of teachers. Teachers ensure the implementation of learning activities according to student characteristics in order to realize educational goals effectively. With these demands, teachers must be able to understand four main competencies, namely professional, social, pedagogical, and personality competencies. One of the crucial competencies is the ability to facilitate interactive learning in the classroom.

Teachers have a central role in the educational process, so they must develop their ability to master learning materials and strategies in order to create meaningful learning. In addition, teachers must continue to keep up with the development and renewal of technology and science that develops in line with the needs of society and the development of the times. The teacher's task is to consistently improve the quality of education so that lessons become clear and easily absorbed by students (Sulastri *et al.*, 2020).

Elements in education include several interrelated things such as educational goals, curriculum, students, teachers, educational interactions, educational content, and educational environment (Triwiyanto, 2014). The objectives of mathematics learning listed in the Curriculum at the Education Unit Level (2006) which were refined in the 2013 curriculum, one of which is to solve problems which include the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained (Ministry of National Education, 2006).

Mathematical problem-solving skills according to Davita & Pujiastuti (2020) are efforts to solve mathematical problems that are carried out by students using their knowledge and abilities. Meanwhile, according to Pratiwi & Musdi (2021), it is explained that in the field of mathematics, students must be able to develop problem-solving skills. The more problem-solving skills a student has,

the greater their mindset. Using problem-appropriate math problem-solving skills can help students solve simpler, complex problems and make ideas concrete. This is in accordance with the opinion of Amam (2017) explaining that it is a person's ability to solve a mathematical problem in the form of non-routine problems and then presented in a contextual or textual format. These questions are designed to evaluate students' problem-solving abilities.

Currently, Indonesian students are considered to have low mathematical solving skills. PISA, organized by the OECD, evaluates the ability of 15-year-olds in mathematics, science, and reading. The 2022 PISA results show a decline in Indonesia's scores in these three areas. The 2022 exam results show reading, math, and science scores of 359, 366, and 383, respectively. This value is lower than the 2018 test scores of 371, 379, and 396, respectively (OECD, 2022).

SD Negeri Banjarsari also experienced problems related to the low level of students' understanding when solving a mathematics problem. Based on the results of interviews and the average score of the math problem-solving test, many students have not reached the minimum passing score of 70. This is due to their inability to understand the basic ideas needed to solve problems, and their focus on the end result. Another reason for the low scores of students is because conventional teaching methods have not been developed into interactive learning designs that can motivate students and make the teaching and learning process interactive. Therefore, educators must plan a learning model. One such model is the NHT model.

The NHT learning model was first developed by Kagan in 1993. This cooperative learning model asks students to compile and present their work according to their abilities. This model is characterized by student cooperation in small groups, and is typically used to engage students in improving their understanding of the subject matter or to evaluate how well they understand the material (Nisa *et al*., 2023). In line with Salsabila's opinion. *et al* (2025) explain that the NHT learning model emphasizes student involvement in identifying, analyzing, and communicating information from various sources before sharing it with the rest of the class. This approach provides students with the opportunity to actively participate in the learning process, work in groups, and take responsibility for the results of their group's work.

According to Andriawan (2022), learning NHT can increase students' cooperative attitudes, joy, courage, activeness, critical attitude, and democratic attitudes. In addition, according to Firmansyah & Solihah (2019), the NHT model has succeeded in fostering students' interest and interest in mathematics learning.

In addition to still implementing conventional learning, teachers only use available textbooks. As a result, teachers only explain the material according to the book without looking for alternative methods to optimize learning objectives. The learning process, especially for mathematics subjects, will be more meaningful if teachers use a learning model with open-ended questions.

According to Karti and Syofiana (2021), open-ended questions are questions that are not well defined with various approaches and various possible answers. This is in line with research (Yuliana, 2015) explaining that open-ended questions are intended to encourage students' increased understanding of the problem asked, improve their intellectual abilities, and improve their experience in the process of finding something new. Open-ended questions give students the freedom to use the various methods they deem most appropriate to solve the problem.

The selection of an open-question assisted NHT learning model can help students in the ongoing learning process, especially mathematics materials where many students are involved in the form of groups in collaboration and exchange ideas to study the material and understand concepts in solving an existing problem in various alternative ways.

METHODS

This study uses a quantitative method with a *one-shot case study type experimental approach*. In this design, a group of students is given treatment in the form of the application of the NHT learning model assisted by open-ended questions, then the results are observed without a comparison group. This approach aims to determine the direct impact of the treatment on the variables studied.

$$\boxed{\textbf{X O}}$$

Figure 1 Paradigm *One-Shot Case Study* (Sugiyono, 2015).

This research will be conducted on grade IV students at SD Negeri Banjarsari. *Probability Sampling* with *Simple Random Sampling* as many as 31 students were randomly selected for quantitative analysis. The strategy used by researchers to collect research data is known as data collection techniques. In this study, the test of problem-solving ability and activity observation using the NHT learning model with open-ended questions was used to collect quantitative data. The findings of the test are supported by documentation in addition to tests and observations.

RESULTS AND DISCUSSION

The results of data analysis were obtained from 31 students of class IVA. The data was analyzed quantitatively to answer the formulation of the previous problem. The analysis was carried out through several stages, including a normality test to determine the distribution of data, a hypothesis test to test the effect of treatment, as well as individual completeness and classical completeness tests to assess the achievement of student learning outcomes both individually and as a class.

Table 1. Normality Test on Observation Values

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
OBSERVATION	,084	31	,200*

Table 1. The normality test of observation values in grade 4 of SD Negeri Banjarsari with the NHT model assisted by open questions obtained data obtained 0.200 > 0.05 showed that this data was normally distributed.

Table 2. Normality Test on Posttest Scores

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Posttest	,094	31	,200*

Table 2. The normality test of the posttest value using SPSS obtained a significant value of 0.200 > 0.05 indicating that this data is normally distributed.

Table 3. Output Anova

Models		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3419,019	1	3419,019	66,058	,000b
	Residual	1500,981	29	51,758		
	Total	4920,000	30			

The data in table 3 shows that the NHT learning model assisted by open questions affects students' mathematical problem-solving ability in grade IV multiplication material at SD Negeri Banjarsari. This can be seen from the sig

value of 0.000 < 0.05, then Ho is rejected. Furthermore, the results of the regression equation can be seen in table 4.

Table 4. Output Coefficients

Models		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-36,831	14,433		-2,552	,016
	OBSERVATION	1,826	,225	,834	8,128	,000

To calculate simple linear regression, we used data from grade IV students of SD Negeri Banjarsari who had received certain treatment. Before performing a simple linear regression calculation, we need to first determine which are independent variables (X) and dependent variables (Y). The value of the independent variable (X) was obtained from the results of observation of the implementation of the open-question assisted NHT learning model. Meanwhile, the value of the dependent variable (Y) was obtained from the results of the posttest. These two values, X and Y, are then used to calculate the constant (a) and the regression coefficient (b). The calculation results show that constant (a) is worth -36.831 and the regression coefficient (b) is 1.826. These numbers are then fed into a simple linear regression equation, being $\hat{Y} = -36.831 + 1.826X$. From this equation, it can be interpreted that every one unit increase in the value of X will increase the value of Y by 1.826 units. This means that there is a positive influence of the NHT learning model assisted by open questions on students' mathematical problem-solving skills. To see how much of an impact it has can be seen in table 5.

Table 5. Output Model Summary

Models	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,834a	,695	,684	7,194

In table 5 it appears that the value of R square, or what is often called the coefficient of determination, is 0.695. This number, if converted into a percentage, shows how much the independent variable, namely the open-question NHT learning model, affects the dependent variable, namely the ability to solve mathematical problems. These results reveal that there is a contribution of 69.5% from the learning model and 30.5% from other external factors that have a role in influencing student learning outcomes.

Meanwhile, there are other factors outside the NHT learning model and open-ended questions that also play a role, with a contribution of 30.5% to the ability to deal with math problems.

The individual completeness test was carried out to measure the average score of mathematics learning outcomes of fourth grade students of SD Negeri Banjarsari after the implementation of the NHT learning model assisted by open questions has achieved completeness individually, on the contrary.

The hypotheses that will be tested in this study are:

H0: $\mu \leq 69.9$ (average mathematics learning outcomes have not exceeded or equal to 69.9)

Ha: > 69.9 (average math learning outcomes exceed 69.9)μ

In this study, there was an individual completeness test assessed using the t-test. The test criterion H_0 was rejected if t was calculated $\geq$ t table with dk = (n-1) and $\alpha = 5\%$. The results of the t-test from this study showed that t calculated as 4.39 and dk = 31-1= 30, and the value of the t table was 1.697, indicating that H_0 was rejected. These results show that the average ability of students to solve math problems has increased beyond 69.9.

After knowing the individual completeness test, a classical completeness test was then carried out to determine the success of grade IV students of SD Negeri Banjarsari after being treated with the NHT learning model with open-ended questions. This test is used to determine whether the proportion of learning outcomes of mathematical problem-solving skills of 4th grade students has reached more than 69.9% or vice versa.

The statistical hypotheses to be tested are as follows:

H0: $\rho \leq 69.9\%$ (the number of students who have completed has not reached 69.9%).

Ha: $> 69.9\%$ (the number of students who completed reached 69.9%). ρ

The calculation of the classical completeness test is carried out with the z-test based on a significant level of 5%. The results show that the value of Z_{is} calculated as 1.76 and the value of $Z_{of\ the\ table}$ is 0.45, so that Z calculates $\geq Z_{table}$ which is 1.76 < 0.45, then minus H_0. This shows that the percentage of students who achieve KKM classically > 69.9%.

CONCLUSION

Based on the results of research carried out at SD Negeri Banjarsari, Ajibarang District, Banyumas Regency on the influence of the open-question assisted NHT learning model on students' mathematical problem-solving ability in grade IV multiplication material, several conclusions can be drawn as follows:

1. There was a significant influence of the application of the open-question NHT learning model   on the ability to solve mathematical problems in class IV, multiplication material by 69.5%, the remaining 30.5% was influenced by other variables.
2. The results of the posttest showed an increase in the average score of students, it can be seen from the initial average score of students who had reached the KKM as much as 35.5% and after the researcher gave treatment to grade IV students, the average score of students became 83.9%.

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The Effect of The *Numbered Heads Together* (NHT) Learning Model Assisted By Open Questions On Mathematics Problem-Solving Skills

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Abstract

Mathematical problem-solving skills are essential for meeting the demands of 21st-century learning. However, most fourth-grade students at Banjarsari State Elementary School have not met the Minimum Competency Criteria (KKM). This study aims to examine the effect of the Numbered Heads Together (NHT) learning model combined with open-ended questions on students' mathematical problem-solving abilities. Using a quantitative experimental design, the study involved fourth-grade students, with data collected through observation, tests, and documentation. The results show that the NHT model assisted by open-ended questions positively affected students' problem-solving skills by 69.9%. Students' average learning outcomes increased significantly, as indicated by Zhitung ≥ Ztabel and thitung ≥ ttabel, leading to the rejection of H_0. These findings demonstrate that cooperative learning with open-ended approaches effectively enhances students' mathematical problem-solving abilities.

Keywords: Numbered Heads Together (NHT), Open-Ended Questions, Problem-Solving Skills.

Abstrak

Kemampuan pemecahan masalah matematika merupakan kompetensi penting dalam pembelajaran abad ke-21. Namun, sebagian besar siswa kelas IV di SD Negeri Banjarsari belum mencapai Kriteria Ketuntasan Minimal (KKM). Penelitian ini bertujuan untuk menganalisis pengaruh model pembelajaran Numbered Heads Together (NHT) berbantuan soal open-ended terhadap kemampuan pemecahan masalah matematika siswa. Penelitian ini menggunakan pendekatan kuantitatif dengan desain eksperimen pada siswa kelas IV, dengan teknik pengumpulan data melalui observasi, tes, dan dokumentasi. Hasil penelitian menunjukkan bahwa model pembelajaran NHT berbantuan soal open-ended memberikan pengaruh positif sebesar 69,9% terhadap peningkatan kemampuan pemecahan masalah matematika. Rata-rata hasil belajar siswa mengalami peningkatan signifikan, ditunjukkan oleh nilai Zhitung ≥ Ztabel dan thitung ≥ ttabel, sehingga H_0 ditolak. Temuan ini menunjukkan bahwa pembelajaran kooperatif berbasis soal open-ended efektif dalam meningkatkan kemampuan pemecahan masalah matematika siswa.

Kata Kunci: Numbered Heads Together (NHT)*, Soal Terbuka, Kemampuan Pemecahan Masalah.*

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INTRODUCTION

Education is the main pillar that contributes significantly to the development process of a nation to face the challenges of the times in the current era of globalization, especially technological developments and various innovations in learning to make it more enjoyable. According to Amadi (2022), it is explained that in the current global context, there is competition that demands adaptation and superior competence. Therefore, the world of education has a great responsibility to provide quality education. The goal is to create graduates with character and skills, and to be able to compete in a competitive global arena.

Education as a means to improve the quality of human resources. Education is not only considered as the delivery of knowledge and skill development, but also to realize one's ideals and potential so that the standard of human life is better than before (Yulaini, 2016). The quality of education is greatly influenced by the ability of teachers. Teachers ensure the implementation of learning activities according to student characteristics in order to realize educational goals effectively. With these demands, teachers must be able to understand four main competencies, namely professional, social, pedagogical, and personality competencies. One of the crucial competencies is the ability to facilitate interactive learning in the classroom.

Teachers have a central role in the educational process, so they must develop their ability to master learning materials and strategies in order to create meaningful learning. In addition, teachers must continue to keep up with the development and renewal of technology and science that develops in line with the needs of society and the development of the times. The teacher's task is to consistently improve the quality of education so that lessons become clear and easily absorbed by students (Sulastri *et al*., 2020).

Elements in education include several interrelated things such as educational goals, curriculum, students, teachers, educational interactions, educational content, and educational environment (Triwiyanto, 2014). The objectives of mathematics learning listed in the Curriculum at the Education Unit Level (2006) which were refined in the 2013 curriculum, one of which is to solve problems which include the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained (Ministry of National Education, 2006).

Mathematical problem-solving skills according to Davita & Pujiastuti (2020) are efforts to solve mathematical problems that are carried out by students using their knowledge and abilities. Meanwhile, according to Pratiwi & Musdi (2021), it is explained that in the field of mathematics, students must be able to develop problem-solving skills. The more problem-solving skills a student has,

the greater their mindset. Using problem-appropriate math problem-solving skills can help students solve simpler, complex problems and make ideas concrete. This is in accordance with the opinion of Amam (2017) explaining that it is a person's ability to solve a mathematical problem in the form of non-routine problems and then presented in a contextual or textual format. These questions are designed to evaluate students' problem-solving abilities.

Currently, Indonesian students are considered to have low mathematical solving skills. PISA, organized by the OECD, evaluates the ability of 15-year-olds in mathematics, science, and reading. The 2022 PISA results show a decline in Indonesia's scores in these three areas. The 2022 exam results show reading, math, and science scores of 359, 366, and 383, respectively. This value is lower than the 2018 test scores of 371, 379, and 396, respectively (OECD, 2022).

SD Negeri Banjarsari also experienced problems related to the low level of students' understanding when solving a mathematics problem. Based on the results of interviews and the average score of the math problem-solving test, many students have not reached the minimum passing score of 70. This is due to their inability to understand the basic ideas needed to solve problems, and their focus on the end result. Another reason for the low scores of students is because conventional teaching methods have not been developed into interactive learning designs that can motivate students and make the teaching and learning process interactive. Therefore, educators must plan a learning model. One such model is the NHT model.

The NHT learning model was first developed by Kagan in 1993. This cooperative learning model asks students to compile and present their work according to their abilities. This model is characterized by student cooperation in small groups, and is typically used to engage students in improving their understanding of the subject matter or to evaluate how well they understand the material (Nisa *et al*., 2023). In line with Salsabila's opinion. *et al* (2025) explain that the NHT learning model emphasizes student involvement in identifying, analyzing, and communicating information from various sources before sharing it with the rest of the class. This approach provides students with the opportunity to actively participate in the learning process, work in groups, and take responsibility for the results of their group's work.

According to Andriawan (2022), learning NHT can increase students' cooperative attitudes, joy, courage, activeness, critical attitude, and democratic attitudes. In addition, according to Firmansyah & Solihah (2019), the NHT model has succeeded in fostering students' interest and interest in mathematics learning.

In addition to still implementing conventional learning, teachers only use available textbooks. As a result, teachers only explain the material according to the book without looking for alternative methods to optimize learning objectives. The learning process, especially for mathematics subjects, will be more meaningful if teachers use a learning model with open-ended questions.

According to Karti and Syofiana (2021), open-ended questions are questions that are not well defined with various approaches and various possible answers. This is in line with research (Yuliana, 2015) explaining that open-ended questions are intended to encourage students' increased understanding of the problem asked, improve their intellectual abilities, and improve their experience in the process of finding something new. Open-ended questions give students the freedom to use the various methods they deem most appropriate to solve the problem.

The selection of an open-question assisted NHT learning model can help students in the ongoing learning process, especially mathematics materials where many students are involved in the form of groups in collaboration and exchange ideas to study the material and understand concepts in solving an existing problem in various alternative ways.

METHODS

This study uses a quantitative method with a *one-shot case study type experimental approach*. In this design, a group of students is given treatment in the form of the application of the NHT learning model assisted by open-ended questions, then the results are observed without a comparison group. This approach aims to determine the direct impact of the treatment on the variables studied.

$$\boxed{\text{X O}}$$

Figure 1 Paradigm *One-Shot Case Study* (Sugiyono, 2015).

This research will be conducted on grade IV students at SD Negeri Banjarsari. *Probability Sampling* with *Simple Random Sampling* as many as 31 students were randomly selected for quantitative analysis. The strategy used by researchers to collect research data is known as data collection techniques. In this study, the test of problem-solving ability and activity observation using the NHT learning model with open-ended questions was used to collect quantitative data. The findings of the test are supported by documentation in addition to tests and observations.

RESULTS AND DISCUSSION

The results of data analysis were obtained from 31 students of class IVA. The data was analyzed quantitatively to answer the formulation of the previous problem. The analysis was carried out through several stages, including a normality test to determine the distribution of data, a hypothesis test to test the effect of treatment, as well as individual completeness and classical completeness tests to assess the achievement of student learning outcomes both individually and as a class.

Table 1. Normality Test on Observation Values

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
OBSERVATION	,084	31	,200*

Table 1. The normality test of observation values in grade 4 of SD Negeri Banjarsari with the NHT model assisted by open questions obtained data obtained 0.200 > 0.05 showed that this data was normally distributed.

Table 2. Normality Test on Posttest Scores

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Posttest	,094	31	,200*

Table 2. The normality test of the posttest value using SPSS obtained a significant value of 0.200 > 0.05 indicating that this data is normally distributed.

Table 3. Output Anova

Models		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3419,019	1	3419,019	66,058	,000b
	Residual	1500,981	29	51,758		
	Total	4920,000	30			

The data in table 3 shows that the NHT learning model assisted by open questions affects students' mathematical problem-solving ability in grade IV multiplication material at SD Negeri Banjarsari. This can be seen from the sig

value of 0.000 < 0.05, then Ho is rejected. Furthermore, the results of the regression equation can be seen in table 4.

Table 4. Output Coefficients

Models		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-36,831	14,433		-2,552	,016
	OBSERVATION	1,826	,225	,834	8,128	,000

To calculate simple linear regression, we used data from grade IV students of SD Negeri Banjarsari who had received certain treatment. Before performing a simple linear regression calculation, we need to first determine which are independent variables (X) and dependent variables (Y). The value of the independent variable (X) was obtained from the results of observation of the implementation of the open-question assisted NHT learning model. Meanwhile, the value of the dependent variable (Y) was obtained from the results of the posttest. These two values, X and Y, are then used to calculate the constant (a) and the regression coefficient (b). The calculation results show that constant (a) is worth -36.831 and the regression coefficient (b) is 1.826. These numbers are then fed into a simple linear regression equation, being $\hat{Y} = -36.831 + 1.826X$. From this equation, it can be interpreted that every one unit increase in the value of X will increase the value of Y by 1.826 units. This means that there is a positive influence of the NHT learning model assisted by open questions on students' mathematical problem-solving skills. To see how much of an impact it has can be seen in table 5.

Table 5. Output Model Summary

Models	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,834a	,695	,684	7,194

In table 5 it appears that the value of R square, or what is often called the coefficient of determination, is 0.695. This number, if converted into a percentage, shows how much the independent variable, namely the open-question NHT learning model, affects the dependent variable, namely the ability to solve mathematical problems. These results reveal that there is a contribution of 69.5% from the learning model and 30.5% from other external factors that have a role in influencing student learning outcomes.

Meanwhile, there are other factors outside the NHT learning model and open-ended questions that also play a role, with a contribution of 30.5% to the ability to deal with math problems.

The individual completeness test was carried out to measure the average score of mathematics learning outcomes of fourth grade students of SD Negeri Banjarsari after the implementation of the NHT learning model assisted by open questions has achieved completeness individually, on the contrary.

The hypotheses that will be tested in this study are:

H0: $\mu \leq 69.9$ (average mathematics learning outcomes have not exceeded or equal to 69.9)

Ha: > 69.9 (average math learning outcomes exceed 69.9)μ

In this study, there was an individual completeness test assessed using the t-test. The test criterion H_0 was rejected if t was calculated $\geq$ t table with dk = (n-1) and α = 5%. The results of the t-test from this study showed that t calculated as 4.39 and dk = 31-1= 30, and the value of the t table was 1.697, indicating that H_0 was rejected. These results show that the average ability of students to solve math problems has increased beyond 69.9.

After knowing the individual completeness test, a classical completeness test was then carried out to determine the success of grade IV students of SD Negeri Banjarsari after being treated with the NHT learning model with open-ended questions. This test is used to determine whether the proportion of learning outcomes of mathematical problem-solving skills of 4th grade students has reached more than 69.9% or vice versa.

The statistical hypotheses to be tested are as follows:

H0: $\rho \leq 69.9\%$ (the number of students who have completed has not reached 69.9%).

Ha: > 69.9% (the number of students who completed reached 69.9%). ρ

The calculation of the classical completeness test is carried out with the z-test based on a significant level of 5%. The results show that the value of Z_{is} calculated as 1.76 and the value of $Z_{of\ the\ table}$ is 0.45, so that Z calculates $\geq Z_{table}$ which is 1.76 < 0.45, then minus H_0. This shows that the percentage of students who achieve KKM classically > 69.9%.

CONCLUSION

Based on the results of research carried out at SD Negeri Banjarsari, Ajibarang District, Banyumas Regency on the influence of the open-question assisted NHT learning model on students' mathematical problem-solving ability in grade IV multiplication material, several conclusions can be drawn as follows:

1. There was a significant influence of the application of the open-question NHT learning model   on the ability to solve mathematical problems in class IV, multiplication material by 69.5%, the remaining 30.5% was influenced by other variables.
2. The results of the posttest showed an increase in the average score of students, it can be seen from the initial average score of students who had reached the KKM as much as 35.5% and after the researcher gave treatment to grade IV students, the average score of students became 83.9%.

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Teacher and Student Engagement Through Educational Technology

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Abstract

The development of digital technology in learning media provides significant opportunities for implementing differentiated instruction. In the digital era, information and communication technology plays an important role in education by enabling more dynamic and varied learning processes and supporting independent learning based on students' learning styles. In mathematics education, technology creates interactive and engaging learning environments and helps address instructional challenges. This study employs a Systematic Literature Review approach to systematically analyze relevant studies. The findings indicate that technology supports cross-regional collaboration and the implementation of Project-Based Learning, enriching students' learning experiences. However, the effectiveness of technology integration depends on the type of technology used and the strategies applied, which must be aligned with pedagogical goals and learners' characteristics.

Keywords: *Digital Technology, Learning Media, Differentiated Learning, Digital Education, Learning Styles*

Abstrak

Perkembangan teknologi digital dalam media pembelajaran membuka peluang besar bagi penerapan pembelajaran berdiferensiasi. Teknologi berperan penting dalam menciptakan proses pembelajaran yang dinamis, variatif, dan memungkinkan peserta didik belajar secara mandiri sesuai dengan gaya belajarnya. Dalam pembelajaran matematika, teknologi mampu menciptakan suasana belajar yang interaktif dan menarik serta menjadi solusi atas berbagai tantangan pembelajaran. Penelitian ini menggunakan pendekatan *Systematic Literature Review* untuk menelaah secara sistematis berbagai studi yang relevan. Hasil kajian menunjukkan bahwa teknologi mendukung kolaborasi lintas wilayah dan penerapan *Project Based Learning* yang memperkaya pengalaman belajar. Namun, efektivitas pemanfaatan teknologi sangat bergantung pada jenis teknologi dan strategi implementasinya, sehingga perlu disesuaikan dengan tujuan pedagogis dan karakteristik peserta didik.

Kata Kunci: *Teknologi Digital, Media Pembelajaran, Pembelajaran Berdiferensiasi, Pendidikan Digital, Gaya Belajar.*

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INTRODUCTION

Student involvement is one of the main indicators of successful learning, as higher levels of participation are closely related to the achievement of learning objectives. However, in today's digitally distracted era, teachers face significant challenges in maintaining students' attention and active engagement in the classroom. Educational technology has emerged as a strategic solution to enhance students' active participation, motivation, and cognitive engagement. Through digital devices and applications, educators can access diverse learning resources that support personalized and differentiated learning tailored to students' needs.

The rapid development of educational technology has transformed learning from a teacher-centered process into a more interactive, flexible, and student-centered experience. Technology is no longer merely a complementary tool, but a core component driving educational transformation toward a more modern and adaptive system. Interactive digital content, online platforms, and virtual learning environments enable students to actively participate in both face-to-face and online learning contexts, thereby enriching their learning experiences and fostering deeper understanding (Asrulla, 2024).

Alongside this transformation, the role of teachers has shifted significantly. Teachers are no longer positioned solely as transmitters of knowledge, but as digital facilitators who guide, motivate, and supervise students through the effective use of technology-based learning environments. Technological advancements encourage teachers to design creative, collaborative, and inclusive learning experiences using interactive platforms and digital media (Pare & Sihotang, 2023). Active student engagement through discussions, group work, and problem-solving activities creates a communicative and creative learning space that supports both academic achievement and personal competency development (Asrulla, 2024). Consequently, teachers are required to continuously improve their professional and technological competencies to design innovative learning strategies that stimulate critical and analytical thinking (Andi Sadriani et al., 2023).

Despite its potential, technology should not be viewed as a substitute for human interaction in education. UNESCO emphasizes that educational technology must enhance learning experiences rather than replace the essential interaction between teachers and students. The Global Education Monitoring (GEM) Report (2023) highlights that the provision of digital tools alone does not

automatically improve learning outcomes without the active involvement of qualified teachers. This underscores that teacher quality remains a key determinant of successful technology integration in education.

Empirical evidence supports the positive impact of educational technology on student engagement. Data from Indonesia's Continuous Professional Development (PMM) platform indicate that more than 80% of teachers participating in online training experience increased student enthusiasm and classroom engagement. Access to webinars, self-paced modules, and virtual professional communities encourages teachers to implement innovative pedagogical approaches, which directly contribute to improved student participation and learning outcomes (Sujarwo, 2013).

However, the implementation of educational technology still faces several challenges. A systematic literature review by Harahap and Napitupulu (2023) reveals a persistent digital divide between urban and rural areas, characterized by unequal access to infrastructure, devices, and internet connectivity. Limited teacher training further constrains effective technology integration, particularly in under-resourced schools. Additionally, students' limited access to digital devices at home and inconsistencies between digital learning content and the national curriculum exacerbate educational inequality (Awanda Mella Stevani, 2024; Randi Maulana, 2025). These challenges highlight the importance of sustained investment in teacher professional development and technological infrastructure to ensure equitable and meaningful learning experiences.

In this context, collaboration among teachers, parents, and technology developers plays a crucial role. Parents are instrumental in guiding children toward the positive and responsible use of technology, while coordinated efforts between educators and technology developers can ensure that digital learning content aligns with pedagogical goals and curriculum standards. Such collaboration is essential in strengthening students' digital literacy and supporting sustainable educational transformation in the 21st century.

Based on the discussion above, this study aims to: (1) examine the role of interactive digital content-based educational technology in enhancing students' engagement, motivation, and cognitive involvement in the learning process; (2) identify effective and contextual strategies for technology implementation in education; and (3) analyze the collaborative role of teachers, parents, and

technology developers in overcoming implementation barriers to support sustainable 21st-century learning transformation.

METHODS

This study applies the Systematic Literature Review (SLR) approach, which is a literature review method that is carried out systematically and thoroughly to select, assess, and synthesize various studies that are relevant to the research focus. The literature study method is an approach used to collect, analyze, and synthesize literature or relevant sources of information that have been previously published (Ujang Jamaludin, 2023). Literature searches are conducted using keywords such as technology education, student engagement, digital learning, which includes publications between 2020-2025. The selection process is carried out in stages, starting from a review of titles and abstracts, to a thorough review of the content of the article. Data collected from Google Scholar, ResearchGate, which was collected including the author's identity, year of publication, methodological approach, main research results, and recommendations submitted.

RESULTS AND DISCUSSION

Integration of Interactive Digital Content-Based Educational Technology Increases Students' Motivation and Cognitive Engagement

The findings indicate that the use of educational technology based on interactive digital content significantly enhances students' learning motivation and cognitive engagement. Such technology enables students to actively participate in the learning process through visual and audio-visual media, while also facilitating two-way interaction. As a result, the learning environment becomes more dynamic and responsive to individual student needs. Platforms such as Quizizz, Kahoot, and Wordwall have been shown to consistently increase student participation and real-time responses. In addition, the use of Canva for Education allows students to express ideas visually, which positively impacts their confidence, particularly among learners with visual learning styles.

Educational technology also promotes collaborative learning. For example, Google Docs enables students to work on assignments simultaneously, either synchronously or asynchronously, thereby strengthening collaboration, interaction, and social skills. The application of Augmented Reality (AR), such as Assemblr Edu, makes science learning more vivid and easier to understand, while gamification elements further increase students' enthusiasm in completing learning challenges (Fira, 2024). At the elementary school level, technology

implementation has resulted in a significant improvement in students' digital literacy, as they become more proficient in operating devices such as computers and tablets through repeated use of digital learning applications (Sella Oktania, 2024). These findings support the argument of Pare and Sihotang (2023), who state that technological developments encourage a shift in teachers' roles from information transmitters to facilitators, motivators, and supervisors who utilize digital platforms to enrich the teaching and learning process.

The Effectiveness of Technology Implementation Depends on Contextual and Targeted Strategies

The studies analyzed in this systematic review emphasize that the effectiveness of educational technology largely depends on implementation strategies that are aligned with local educational contexts, student characteristics, learning objectives, and available resources. Technology integration that ignores contextual factors tends to fail in producing the expected positive outcomes. Therefore, careful selection of technology types, appropriate learning models, and continuous teacher training are critical factors for successful implementation (Ertmer & Ottenbreit-Leftwich, 2010). These findings are consistent with Randi Maulana (2025), who highlights that educational technology has become an integral component of the teaching and learning process and that optimal digital media utilization is essential for addressing challenges such as limited infrastructure.

Furthermore, educational technology implementation strategies must be designed comprehensively, involving all stakeholders and focusing on the creation of adaptive, inclusive, and relevant learning environments. The integration of technology within differentiated instruction fosters more interactive, inclusive, and contextual learning experiences. The development of digital-based instructional materials tailored to students' needs plays a crucial role in increasing student engagement (Aina Nabila, 2025). Through technology, educators can deliver more dynamic and varied learning processes, while students are able to learn independently according to their individual learning styles (Awanda Mella Stevani, 2024). Overall, technological innovation has brought significant transformation to various aspects of life, including education, and continues to shape learning practices in the digital era (Aina Nabila, 2025).

The Collaborative Role of Teachers, Parents, and Technology Developers in Overcoming Implementation Barriers

The transformation of 21st-century learning requires strong cross-sector collaboration. The findings indicate that synergistic involvement among

teachers, parents, and technology developers plays a crucial role in overcoming various barriers to technology implementation, including limited infrastructure, low levels of digital literacy, and resistance to change. Such collaboration strengthens emotional, technical, and pedagogical support for students, enabling sustainable and continuous learning transformation (Asrulla, 2024).

Several challenges commonly encountered during implementation include unstable internet connectivity and teachers' limited readiness to operate educational technology effectively. To address these issues, targeted solutions such as additional teacher training and the provision of simplified, user-friendly learning modules have been implemented. These measures help educators gradually adapt to technological integration while maintaining instructional effectiveness.

In line with this perspective, Prasetyo and Sutopo (2018, as cited in Hatma Heris Mahendra, 2020) emphasize that the Industrial Revolution 4.0 highlights the importance of rapid access to information, characterized by continuous connectivity that enables real-time information exchange. Within this context, the integration of educational technology becomes increasingly essential for preparing students to meet future demands.

Furthermore, recent research (Ayu Fitria Dwi Nuraini, 2025) provides valuable insights for educators, curriculum developers, and policymakers regarding the optimization of technology use in education. These findings underscore the need for coordinated efforts among stakeholders to enhance educational quality and ensure that students are equipped with the skills necessary to face future challenges.

CONCLUSION

The integration of interactive digital content such as Quizizz, Kahoot, Wordwall, Canva for Education, Assemblr Edu, and Google Docs has been shown to significantly enhance students' motivation, active participation, and cognitive engagement. This effectiveness is supported by principles of multimedia learning and self-determination theory, which foster autonomy, competence, and relatedness in the learning process. However, the success of technology integration depends heavily on contextual implementation strategies, including the alignment of tools with student characteristics, the availability of infrastructure, ongoing teacher training, and the development of differentiated, technology-based instructional materials.

Collaboration among teachers, parents, and technology developers is critical in overcoming barriers such as the digital divide, curriculum-content mismatch, and resistance to change. Such coordinated efforts provide emotional, technical, and pedagogical support for students, ensuring sustainable and inclusive 21st-century learning transformation.

Based on these findings, the following integrated recommendations are proposed to optimize the use of educational technology:

1. **School and Teacher Level**: Apply the "3S" framework—*Self-regulation cues, Segmenting content ≤7 minutes, and Scaffolded off-device time*—to minimize digital distractions. Conduct regular co-design sessions with developers to align content with learning objectives. Engage parents through dashboards and programs such as device stewardship and digital literacy workshops. Prioritize low-bandwidth tools with offline capabilities and assess students through digital portfolios that measure collaboration and creativity, not just correct answers.

2. **Policy Level**: Establish national technical standards for schools, including a device-to-student ratio ≥1:1 and minimum internet speed ≥20 Mbps. Allocate dedicated funding for devices and internet access for students with special needs or from low-income families. Reform teacher training programs into competency-based micro-credentials focused on interactive content design. Develop partnerships between government and industry to ensure ed-tech products meet curriculum standards and data ethics guidelines. Implement continuous monitoring via a national dashboard to track participation and trigger early interventions in disadvantaged areas.

By implementing these strategies at both operational and policy levels, technology-based learning transformation can not only improve immediate learning outcomes but also cultivate an adaptive, collaborative, and digitally literate generation, ready to face the challenges of the 21st century.

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Iin Karlina

Needs Analysis for Developing an Indonesian Language Learning Module Based on *the Estafet Writing Model*

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Abstract

This study aims to analyze the needs for developing an Indonesian language learning module based on the Estafet Writing model for elementary school students. The study is motivated by students' low narrative writing skills and the limited availability of teaching materials that support collaborative and creative writing processes. This research employed a qualitative descriptive approach, involving teachers and fourth-grade students from two elementary schools in Garut Regency. Data were collected through questionnaires and pre-writing tests. The results indicate that all students lacked additional writing materials, most students preferred visual media (90%), and 77.5% were interested in Estafet Writing activities. The average writing skills were still low, with scores of 38.2% and 43.2%. These findings highlight the need to develop an Estafet Writing module that integrates collaboration, creativity, and visual media to improve students' motivation and narrative writing skills. The module is expected to serve as a contextual and adaptive instructional guide for teachers to conduct more interactive and meaningful Indonesian language learning.

Keywords: *Needs Analysis; Indonesian; Estafet Writing; Writing Skills; Learning Module*

Abstrak

Penelitian ini bertujuan menganalisis kebutuhan pengembangan modul pembelajaran Bahasa Indonesia berbasis model Estafet Writing pada peserta didik sekolah dasar. Latar belakang penelitian ini adalah rendahnya keterampilan menulis naratif peserta didik dan keterbatasan bahan ajar yang belum mendukung proses menulis secara kolaboratif dan kreatif. Penelitian menggunakan pendekatan deskriptif kualitatif dengan subjek guru dan siswa kelas IV di dua sekolah dasar di Kabupaten Garut. Data dikumpulkan melalui angket dan tes awal menulis. Hasil penelitian menunjukkan bahwa seluruh peserta didik belum memiliki bahan ajar tambahan untuk menulis, sebagian besar menyukai media visual (90%) dan tertarik pada kegiatan menulis estafet (77,5%). Rata-rata keterampilan menulis masih rendah, yaitu 38,2% dan 43,2%. Temuan ini menunjukkan perlunya pengembangan modul Estafet Writing yang mengintegrasikan kolaborasi, kreativitas, dan media visual untuk meningkatkan motivasi dan kemampuan menulis naratif siswa. Modul ini diharapkan menjadi panduan kontekstual dan adaptif bagi guru dalam melaksanakan pembelajaran Bahasa Indonesia yang lebih interaktif dan bermakna.

Kata Kunci: *Analisis Kebutuhan; Bahasa Indonesia; Estafet Writing, Keterampilan Menulis; Modul Pembelajaran*

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INTRODUCTION

The 21st-century educational paradigm demands a shift in the role of educators, from mere cognitive transmitters to catalysts focused on developing 21st-century essential competencies (4Cs), namely creativity, collaboration, critical thinking, and effective communication in students (Wulansari & Sunarya, 2023) . Specifically, in the realm of Indonesian language learning, teachers' pedagogical capabilities must go beyond mastery of substantive material. These competencies include the ability to carry out coherent instructional design in creating transformative and meaningful learning experiences (*meaningful learning)* , as well as process-based ones that emphasize the active construction of knowledge and language skills (Rahayu & Rosdiana, 2022) . One of the main demands is the availability of contextual, adaptive, and aligned teaching materials to students' needs, so that learning emphasizes not only linguistic aspects but also the function of language as a means of thinking, expression, and social interaction.

On the other hand, students at the elementary school level are required to master four language skills, namely listening, speaking, reading, and writing skills in a balanced manner. Among these four skills, writing skills are often the most difficult challenge because writing requires the ability to organize ideas, choose diction, construct effective sentences, and convey meaning in a coherent and coherent manner. Writing skills are not the result of mastering theory alone, but rather a practice process that requires direction, formative feedback, and opportunities for repeated experimentation (Mustafa & Efendi, 2016) . Therefore, innovations in writing learning are needed that can foster creativity, social interaction, and learning motivation.

In this context, learning modules play a strategic role as instructional guides that systematically integrate objectives, materials, activities, and evaluation. Effective modules not only present content but also serve as instruments that guide students in critical and creative thinking through reflective and collaborative activities. Such modules should support active learning, independence, and reciprocal interaction between students and teachers.

One relevant learning model for developing creativity and collaboration in writing is *Estafet Writing*. This model emphasizes a chain writing process, where each student writes a specific section of the text and is continued by their group mates until a unified story is formed (Setiawan, 2018) . Through this process, students learn to communicate, empathize, and take responsibility for group results. The implementation of the Estafet Writing model makes writing activities more dynamic, interactive, and meaningful.

However, initial observations and findings from several studies indicate that in Indonesian language learning practices in elementary schools, the learning process is not yet supported by specific learning modules. Teachers generally still rely on conventional textbooks that are general in nature and oriented towards theoretical delivery of material. These textbooks are not able to facilitate collaborative and creative writing activities, because the activities presented tend to emphasize structural and individual exercises. As a result, students have less opportunity to develop ideas freely, collaborate, and reflect on their writing. This condition indicates a research gap, namely the lack of an Indonesian language learning module based on the *Estafet Writing model* specifically designed to improve narrative writing skills through collaborative activities in elementary schools. This condition is also reinforced by findings in research conducted by (Islamiah et al., 2023) , which explained that students often experience difficulty in expressing ideas in writing, not due to their weaknesses, but due to the use of inappropriate learning methods and models. The lack of teacher creativity in designing writing activities makes learning feel monotonous, so students are less motivated to write. Therefore, teachers need to be more creative and innovative in selecting and implementing learning methods that can foster students' interest and enthusiasm for writing.

This research offers a contribution in the form of developing an Indonesian language learning module based on the *Estafet Writing model* that is contextual, collaborative, and encourages students' creative thinking skills. This module is expected to provide a solution to the limitations of teaching materials that currently do not accommodate the writing process as a social and reflective activity.

A needs analysis for the development of this module is a crucial step in ensuring alignment between the theoretical design and empirical reality in the field. Through an in-depth analysis of teacher needs, student abilities, and learning environment conditions, the resulting module is expected to have high relevance and strong implementability. With a clearly identified needs basis, the *Estafet Writing module* can truly function as an effective learning medium, adaptable to student characteristics, and able to direct the writing process towards a more collaborative and meaningful direction, oriented towards the development of students' creative potential.

Based on the background that has been explained previously, this study aims to describe the actual condition of students' writing skills in elementary schools, analyze the needs of teachers and students for innovative teaching materials, and design specifications for Indonesian language learning modules

based on the *Estafet Writing model* that are adaptive and relevant to students' needs.

Thus, this research is expected to provide an empirical basis for the development of modules that not only function as learning media, but also as a means of strengthening creativity, collaboration, and meaningfulness in the writing process of elementary school students.

METHOD

This research is part of a research *and development* (R&D) program aimed at producing an Indonesian language learning module based on the *Estafet Writing model*. However, this article specifically focuses on the initial stage, namely needs analysis, which serves as a conceptual and empirical basis before the product design and development stages are carried out.

In this needs analysis stage, a qualitative descriptive approach was used, because the research aims to describe in depth the actual conditions in the field related to the implementation of writing learning, students' writing skills, and the needs of teachers and students for relevant and contextual learning modules. Descriptive research is conducted to describe, interpret, and explain a variable or phenomenon that is the object of study (Sukardi, 2007) .

The research was conducted at two elementary schools in Garut Regency: SDN 02 Singajaya and SDN 03 Sukawangi. These schools were chosen because initial observations indicated that students had low writing skills, particularly in developing ideas coherently and creatively. Furthermore, Indonesian language learning tends to be conventional and focuses on the final product, rather than the collaborative writing process. These conditions make these schools relevant as research locations because they reflect a real need for innovative teaching materials that support creative writing learning based on the *Estafet Writing model*.

The subjects of this study were 40 fourth-grade students. Subject selection was purposive, meaning that it was based on specific considerations relevant to the research objectives, namely teachers and students directly involved in the writing learning process.

The instruments in this study consisted of an open-ended questionnaire completed by educators and a closed-ended questionnaire given to students, complete with an initial writing ability test on the instrument sheet. Furthermore, instrument validation was conducted through *expert judgment* by language

experts and learning media experts to ensure the appropriateness of the questionnaire items and writing assessment rubric.

Table 1. Student Needs Analysis Questionnaire Grid

No	Aspect
1.	Availability and use of supporting teaching materials other than the main textbook
2.	The level of interest and views of students towards narrative story writing activities
3.	Types of support or media that students need in the process of writing stories
4.	Students' choices and interests in the learning methods used
5.	Previous experiences and expectations of students regarding the implementation of relay writing activities

The stages in conducting data analysis according to Miles and Hubberman (in (Sugiyono, 2017)) are 1) the data reduction stage obtained from the results of the analysis of questionnaires filled out by students, initial writing ability tests, and the results of the analysis of teaching materials used by students; 2) the data presentation stage (data display), namely compiling the findings in the form of graphs and narratives so that they are easy to read and interpret; 3) the conclusion, namely interpreting the data to obtain a picture of the real needs of students for the Indonesian language learning module based on *Estafet Writing.*

RESULTS AND DISCUSSION

Results

The results of this study present a needs analysis for the development of an Indonesian language learning module based on the *Estafet Writing model* for elementary school students. Data collection was conducted at SDN 02 Singajaya and SDN 03 Sukawangi, Garut Regency, through a review of learning resources, a student analysis questionnaire, and a pre-test of narrative writing skills.

Learning Resources Analysis Results

`The results of the study show that the main learning resources used by teachers and students in learning Indonesian are Indonesian language textbooks. *See Around Elementary School Grade IV* (Nukman & Setyowati, 2021) published by the Research, Development, and Book Agency, Ministry of Education, Culture, Research, and Technology. This book is structured based on the principles of the Independent Curriculum and contains eight thematic chapters relevant to students' daily lives.

However, in-depth analysis revealed that the textbook does not explicitly address narrative writing in its entirety. For example, in the chapter *"Meliuk dan Menerjang" (The Twist and the Jump*), students are directed to write about their experience watching a badminton match using the "ADIKSIMBA" method. However, the structural aspects of narrative text (orientation, complication, resolution) and linguistic elements are not systematically explained. As a result, writing instruction remains mechanistic and does not foster creative or collaborative thinking skills.

This finding reinforces the urgency of developing a special module that functions as a systematic guide for teachers in teaching narrative writing skills with a collaborative approach such as *Estafet Writing* .

Student Needs Analysis

A needs analysis questionnaire was distributed to 40 fourth-grade students from both schools. The aspects measured can be seen in Table 1.1 Student Needs Analysis Questionnaire Outline. The five aspects were then developed into 19 questions and concluded with a test of students' initial writing abilities. The results of the student needs analysis questionnaire can be seen in Table 1.2 below:

Table 2. Results of the Student Needs Analysis Questionnaire

Indicator	Percentage	Findings
Availability of additional teaching materials	100% of students stated that there were no additional teaching materials available other than the main textbook.	Indonesian language learning in fourth grade is not yet supported by dedicated learning modules. Teachers still rely on conventional, theoretical textbooks that don't facilitate creative or collaborative writing exercises.

Motivation and interest in writing	On average, 81% of students stated that they enjoyed writing activities, but only 47.5% did it regularly and 80% admitted that they still experienced difficulties when writing.	Students have positive motivation towards narrative writing activities, but the practice of writing has not become a habit due to limited guidance, ideas, and supporting media.
Difficulty in writing	As many as 62.5% of students had difficulty finding story ideas, and some had difficulty composing and ending stories.	The main obstacles for students in writing lie in the prewriting stage (finding ideas) and organizing the plot. Learning strategies are needed that help them develop ideas and writing structures gradually.
Use of media in learning to write	Around 87% of students like using images, 72% feel helped in writing after seeing images, but 42.5% have never used visual media in writing activities.	Visual media such as pictures or illustrations have great potential to improve writing creativity, but their use in the classroom is still limited and has not yet become part of the writing learning strategy.
Use of learning methods	Around 90% of students are not familiar with or have never tried the relay writing method, but 80–92% show interest in writing with friends.	Collaborative methods such as *Estafet Writing* have not been implemented in schools, even though students show high interest in collaborative writing activities that allow for sharing ideas and experiences.
Interest in additional	100% of students stated that they wanted to have	Students expect modules that are able to combine writing activities with visual elements, so that the writing process

teaching materials	interesting, illustrated, and motivating teaching materials for writing stories.	becomes more enjoyable and easier to understand.
Preferences for learning how to write	72.5% of students prefer to write collaboratively, while 27.5% prefer to write individually.	This tendency shows that students are more motivated when interacting and exchanging ideas with friends, so that collaboration-based methods such as Estafet Writing are very relevant to implement.

Pre-test Results of Students' Writing Skills

Furthermore, to validate these findings and obtain a more objective picture of students' initial writing abilities, a pre-test of narrative writing skills was conducted. This pre-test aimed to determine the extent of students' basic abilities in developing ideas, constructing story structures, and using linguistic elements appropriately before the learning module was developed and implemented. The results of the pre-test serve as an important basis in determining the direction of module development based on the *Estafet Writing model* , so that it truly fits the needs and factual conditions of students in the field. The results of the pre-test of writing skills of fourth-grade students at SDN 02 Singajaya and SDN 03 Sukawangi can be seen in table 1.3 below:

Table 3. Writing Skills Pre-test Results

School	Average Writing Skill Score	Category
SDN 02 Singajaya	38.2%	Low
SDN 03 Sukawangi	43.2%	Low

The relatively small 5% difference in scores between the two schools indicates that students' writing skills in the region are generally low and require innovative learning interventions. This limitation is influenced by the use of textbooks that do not emphasize the writing process and the limited opportunities for collaborative writing activities.

Discussion

Learning Resources Analysis

Findings from the analysis of learning resources indicate that the learning resources used in schools still have limitations in supporting systematic and in-depth writing learning. Although the *"Look Around" book* includes writing activities based on students' experiences, the approach used is still superficial *and* does not lead to mastery of writing concepts through the process. Students are directed to write, but without sufficient understanding of the narrative elements, text structure, or language techniques that should be mastered.

The absence of discussion on structure and linguistic rules causes the writing process to become a spontaneous activity without a strong conceptual foundation. In fact, narrative writing skills require the ability to develop ideas in a sequential, coherent, and logical manner, which can only be achieved if students understand how texts are constructed and revised. In line with the opinion put forward by (Knapp & Watkins, 2005) that writing activities are a complex and challenging process, so a structured and directed methodological framework is needed at each stage of learning. In addition, the learning model used in the book tends to be individual and final assignment-based, not providing space for collaboration or interaction of ideas between students, which are actually important aspects in fostering creativity and critical thinking skills.

This situation demonstrates a gap between curriculum objectives and the implementation of teaching materials in the field. While textbooks attempt to foster a spirit of independent learning, they fail to provide concrete tools for developing writing skills in a gradual and reflective manner. According to Nunan (1999), The ability to produce coherent, flowing, and thought-rich writing is one of the most challenging language skills to master. Therefore, writing instruction in schools requires special attention and more intensive management. Therefore, the results of this analysis reinforce the urgency of developing an Indonesian language learning module based on the *Estafet Writing model* . This model enables students to write collaboratively and in a process, so they not only produce text but also learn to construct, revise, and refine ideas together.

Student Needs Analysis

After analyzing the teaching materials used, the next step was to review the actual conditions in the field through student responses. The questionnaire data obtained provided an overview of student motivation, interest, and learning experiences in writing activities. These findings revealed a gap between student interest in writing activities and the availability of learning support facilities.

Although students showed positive interest in writing activities, their writing activities were not developed routinely due to a lack of varied media and motivating learning methods. The implementation of a variety of learning methods aims to reduce student boredom in the learning process, increase their motivation to understand the material, foster curiosity about new things, adapt learning to various student learning styles, and increase their participation and active involvement during teaching and learning activities (Rusiadi, 2020) .

The lack of additional teaching materials in Indonesian language learning is one factor that can hinder the development of students' writing skills. The textbooks used are still general and do not provide material that specifically stimulates narrative writing skills through contextual experiences. This is in line with the opinion expressed by (Pratiwi & Alimuddin, 2019) in their research that teaching materials need to be developed to align with the real conditions and needs of students, because centrally provided materials are not necessarily relevant to the learning context in the region. Therefore, the development of teaching materials that include higher-order thinking skills is an alternative solution to address the challenges and learning needs of students in a more contextual manner .

Furthermore, the questionnaire results showed that students greatly appreciated the use of visual media, such as images, and found it helpful in developing story ideas. This reinforces the argument that visual stimuli can enhance students' imaginative thinking skills, which are crucial for narrative writing. Imaginative skills are important to develop because they help children explore various possibilities and foster the ability to see opportunities through new ideas that emerge from the creative thinking process (Rahmadaningsi et al., 2018) . This finding aligns with previous research showing that the use of visual media can stimulate learning motivation and strengthen memory in writing.

From a methodological perspective, the unfamiliarity of the *Estafet Writing model* in schools indicates an opportunity for innovation in writing instruction. This model aligns with the characteristics of elementary school-aged children, who tend to enjoy working together and learning through interactive activities. Students' interest in trying writing in turns indicates that collaborative approaches such as *Estafet Writing* have the potential to be effective in developing narrative writing skills. Interactive learning conducted through group collaboration can foster empathy, increase tolerance, and strengthen a sense of responsibility among students (Kurnanto et al., 2023) .

Based on the results of the needs analysis that indicate a high level of interest from students in writing activities and more engaging teaching materials, the next step is to examine students' factual abilities in narrative

writing through pre-test results. This analysis is important to understand the extent of students' initial skills in expressing ideas coherently, creatively, and in accordance with linguistic rules, so that it can be used as a reference in assessing the relevance and urgency of developing a learning module based on the *Estafet Writing model.*

Pre-test of Students' Writing Skills

The results of the narrative writing skills pre-test indicate that students have not yet mastered the thinking and language processes required to write narrative texts. The average score, which is still below 50%, indicates that students' abilities to develop ideas, organize storylines, and use language effectively are still weak. This is in line with the results of the previous needs analysis, which showed that students enjoy writing activities but are not yet accustomed to doing it regularly and still have difficulty expressing ideas in a complete written form.

This situation can also be linked to findings on learning resources and teaching methods used in schools. Teachers tend to rely on conventional teaching materials that focus on the final written product, rather than the ongoing writing process. As a result, students lack the opportunity to experience writing through the stages of planning, idea development, revision, and text refinement. Research conducted by (Fitriani, 2021) explains that the use of unengaging media can make writing lessons monotonous and boring. Therefore, efforts are needed to arouse students' interest in the material so that the learning process and outcomes can be optimally improved.

The low pre-test results provide a strong basis for the need for innovation in the writing learning process, one of which is through the implementation of the *Estafet Writing model* . This model has the potential to help students write collaboratively and reflectively, allowing them to complement each other's ideas, enrich their vocabulary, and gain a deeper understanding of text structure. Thus, these pre-test results not only reflect the initial state of students' abilities but also provide an empirical basis for the development of more effective and contextual learning modules.

Overall, the results of this needs analysis indicate the importance of developing teaching materials based on the *Estafet Writing model* with chained images. These teaching materials are expected to integrate visual and collaborative aspects to increase the interest, motivation, and narrative writing skills of fourth-grade elementary school students.

CONCLUSION

The results of this study indicate that Indonesian language learning in elementary schools still faces obstacles in developing students' narrative writing skills. While the textbooks used support the spirit of Freedom to Learn (Merdeka Belajar), they do not yet facilitate collaborative and creative writing activities. A needs analysis indicates that students have a high interest in writing, but writing practices have not been consistently developed due to limited media and learning methods. Furthermore, strong interest in the use of images and group writing activities involving collaboration among students was found.

These findings emphasize the need to develop additional teaching materials in the form of a learning module based on the *Estafet Writing model* that can encourage collaboration, creativity, and reflection in the writing process. However, this study is limited by the relatively small number of subjects and the involvement of only two elementary schools in Garut Regency, so the generalizability of the results is still limited. Future research is expected to focus on the design, validation, and broader testing of *the Estafet Writing- based module to assess its effectiveness in improving students' narrative writing skills in various learning contexts.*

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Cooperative Learning Model in Improving Thematic Learning Outcomes of Grade III Students of SDN 02 Bojong Cikupa Tangerang

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Abstract

This study aims to examine the effectiveness of the Student Teams Achievement Division (STAD) cooperative learning model in improving thematic learning outcomes of third-grade elementary school students. The study is motivated by the dominance of one-way lecture methods in thematic learning, which results in low student participation and suboptimal learning outcomes. A quasi-experimental method with a One Group Pretest–Posttest design was employed, involving 25 third-grade students at SDN 02 Bojong Cikupa, Tangerang. Data were collected through thematic learning achievement tests administered before and after the implementation of the STAD model and analyzed using a paired sample t-test. The results show a significant improvement in students' learning outcomes after the application of the STAD model ($p < 0.05$). Therefore, it can be concluded that the STAD cooperative learning model is effective in enhancing students' thematic learning outcomes and promoting active participation in elementary school classrooms.

Keywords: Learning Outcomes, Learning Cooperative, Learning Thematic, STAD.

Abstrak

Penelitian ini bertujuan untuk mengetahui efektivitas penerapan model pembelajaran kooperatif tipe Student Teams Achievement Division (STAD) dalam meningkatkan hasil belajar tematik siswa kelas III sekolah dasar. Penelitian ini dilatarbelakangi oleh pembelajaran tematik yang masih didominasi metode ceramah satu arah sehingga siswa kurang aktif dan hasil belajar belum optimal. Penelitian menggunakan metode eksperimen semu dengan desain One Group Pretest–Posttest terhadap 25 siswa kelas III SDN 02 Bojong Cikupa, Tangerang. Data dikumpulkan melalui tes hasil belajar sebelum dan sesudah penerapan model STAD dan dianalisis menggunakan uji Paired Sample t-test. Hasil penelitian menunjukkan adanya peningkatan hasil belajar yang signifikan setelah penerapan model STAD ($p < 0,05$). Dengan demikian, model pembelajaran kooperatif tipe STAD efektif meningkatkan hasil belajar tematik siswa serta mendorong keterlibatan aktif dalam pembelajaran.

Kata Kunci: Hasil Belajar, Pembelajaran Kooperatif, Pembelajaran Tematik, STAD.

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INTRODUCTION

Thematic learning at the elementary school level is an integrated learning approach designed to connect various basic competencies from several subjects into one specific theme so that students have a more meaningful learning experience. Thematic learning requires the active involvement of students in the learning process so that students not only receive information, but play a role in building understanding through contextual and student-centered activities (Kemendikbudristek: 2021). This approach is in line with the demands of the Pancasila Student Profile and the needs of the 21st century which require students to have critical thinking skills, creativity, communication skills, collaboration, and technological literacy.

Philosophically, thematic learning is rooted in the theory of constructivism which emphasizes that knowledge is constructed by students through experience and social interaction in the learning environment (Siregar & Nara: 2021). Thus, learning is not only oriented to academic results, but also to the development of character, social skills, and problem-solving skills that arise in daily life. Through the integration of themes as a binding between disciplines, students are expected to be able to understand the relationships between concepts and apply them in real contexts, rather than learning concepts separately in fragmented subjects.

However, the reality of the implementation of thematic learning in Indonesian schools shows that there are still serious challenges. Many teachers still apply traditional learning models such as one-way lecture and question and answer methods that do not provide enough space for students to think critically or collaborate in learning. This habit is often caused by several factors such as the limited understanding of teachers about active learning strategies, limited infrastructure, and a learning culture that still places students as learning objects (Siregar & Nara: 2021).

As a result, thematic learning that is supposed to foster active participation and creativity of students has not been fully achieved. Several evaluative studies have noted that low student involvement during the learning process has a direct impact on the low achievement of thematic learning outcomes, especially on the ability to understand concepts and their application in real-life contexts (Putri & Mulyono: 2023). This condition shows that there is a gap between the idealism of curriculum policy and learning practices in the field, so that learning model

innovation is needed that is able to increase student learning participation to support the success of the implementation of thematic learning optimally.

One of the learning strategies that is believed to be able to increase active participation and student learning outcomes is the cooperative learning model. This model emphasizes cooperation in small groups with the principle of positive interdependence and individual accountability, where the success of the group is largely determined by the contribution of each of its members (Slavin: 2019). The basic principle is based on the view that learning will be more effective when students can discuss, exchange ideas, provide feedback, and help each other in understanding the subject matter. Therefore, cooperative learning places students as active subjects who construct knowledge with their group members, in line with the theory of social constructivism that emphasizes the role of interaction in intellectual development.

Various studies have proven that cooperative learning models are able to have a significant impact on academic achievement, learning motivation, problem-solving skills, and social skills of students at various levels of education (Tondok et al.: 2024). Recent meta-analyses show that cooperative learning has high effectiveness in improving learning outcomes, both in the cognitive and affective domains, especially when managed with a clear group structure and individual contribution-based assessments (Yaşar et al.: 2024).

Not only in the international context, research in Indonesian elementary schools also found that the application of cooperative learning can increase students' activeness in the learning process while improving their learning outcomes. Teachers who implement cooperative learning report an increase in student social interaction, confidence, and the ability to work together in completing group tasks (Wibawa: 2023). Research on low grades also shows that group work provides a comfortable learning environment for students who have academic weaknesses to learn from peers, thereby reducing gaps in learning achievement (Veldman et al.: 2020).

Thus, the application of the cooperative learning model is a relevant pedagogical solution to overcome the problem of low student learning participation in thematic learning in elementary schools. Heterogeneous group formation and collaborative assignments encourage each student to participate, share ideas, and develop academic and social abilities simultaneously. Therefore, cooperative learning has an urgency to be implemented as an effort to improve the quality of learning in elementary schools, including in the context of SDN 02 Bojong Cikupa Tangerang.

One of the learning strategies that can support the successful implementation of thematic learning is the cooperative learning model. Cooperative learning is an approach that organizes students in small groups heterogeneously to work together in achieving learning objectives, where each member is responsible for his or her own learning outcomes and the group's success (Johnson & Johnson: 2018). The principles of positive interdependence, individual accountability, and face-to-face interaction are the basis for facilitating the process of knowledge construction through social interaction. This concept is in line with Vygotsky's theory of social constructivism which asserts that students' cognitive development is strongly influenced by collaboration with others in the proximal developmental zone (Vygotsky: 1978 in Rustaman: 2020).

In Indonesia, research shows that cooperative models contribute significantly to improving students' learning activities, communication skills, and problem-solving skills in elementary schools (Suhadi: 2022). The cultural habits of mutual cooperation and group work learning inherent in the Indonesian socio-cultural context also make cooperative learning very relevant to be applied in elementary school classrooms (Kusumadewi: 2021). In addition, this approach has been proven to be able to overcome the problem of achievement inequality in heterogeneous classes, because students with high abilities can help weaker friends so that an equitable distribution of academic achievement is created (Majid: 2020).

Empirical evidence in primary schools suggests that cooperative learning consistently improves thematic learning outcomes. Students show a change in learning behavior from passive to more active when given the opportunity to discuss material, express opinions, and complete tasks collaboratively (Wahyuni: 2023). In addition, group interactions help students overcome comprehension barriers through peer tutoring and scaffolding strategies provided by peers, so that the understanding of concepts is deeper and lasts longer (Ramdani & Harun: 2022).

Looking at this context, the cooperative learning model is the right strategy to answer the challenges of implementing thematic learning in Indonesian elementary schools, especially in increasing student participation and learning outcomes. Therefore, the application of cooperative models such as the Student Teams Achievement Division (STAD) is seen as very potential to strengthen the quality of thematic learning at SDN 02 Bojong Cikupa Tangerang.

In the context of learning in Indonesia, the implementation of ideal thematic learning still faces challenges in the lower grades of elementary schools.

Although thematic learning requires students to actively relate various concepts meaningfully, its implementation in some elementary schools, including public schools in urban areas, still tends to use methods that lack interaction and collaboration. This is an important basis for making innovative efforts through the application of cooperative learning models such as STAD, especially at the third grade level of elementary school which is the initial stage of children's formal intellectual development (Yusnita: 2022).

In the context of SDN 02 Bojong Cikupa Tangerang, the composition of students shows heterogeneous characteristics both in terms of academic ability, learning motivation, and family socioeconomic background. This diversity is very suitable for the application of the STAD model, because group heterogeneity is one of the main principles of the success of cooperative learning (Mahfud: 2021). In addition, the Tangerang area as part of the urban area has educational dynamics that demand to improve the quality of learning through strategies that are able to build positive social interactions between students (Hidayati: 2023).

The research gap that is to be filled in this study is the lack of research that explicitly examines the effectiveness of the STAD model in grade III thematic learning in urban public schools in Indonesia. Most previous studies have placed more emphasis on learning a single subject such as Mathematics or Science, and the focus has been on high grades or junior high schools (Suhadi: 2022). Thus, this study presents a new perspective that is different from previous research.

In addition to analyzing the improvement of learning outcomes through pretest–posttest comparisons, this study also assesses the implementation of the model in the classroom, student responses, and supporting/inhibiting factors that arise in the implementation of STAD. This strengthens the methodological aspect because it not only measures the output (learning outcomes), but also the learning process that affects the success of the model (Ramdani & Harun: 2022).

The novelty of this research lies in the application of the STAD-type cooperative learning model specifically in thematic learning in grade III elementary school students, which was rarely the focus of previous research because most studies related to STAD were conducted more on single subjects and at higher levels. In addition, this research was conducted at SDN 02 Bojong Cikupa Tangerang as a public school in urban areas that has heterogeneous and dynamic characteristics, but there is still a lack of empirical studies related to the implementation of STAD in the context of the 2013 Curriculum and the Independent Curriculum. Another novelty is that this study not only evaluates

the improvement of thematic learning outcomes through the analysis of pretest and posttest scores, but also explores the dynamics of learning implementation in the classroom, student responses during the process, as well as supporting factors and obstacles that arise during the application of the model. Therefore, this research makes a more comprehensive contribution in understanding the effectiveness of the STAD model in improving the quality of thematic learning at the basic education level.

METHOD

This study uses a quantitative approach with a quasi-experimental design method. This method was chosen because the researcher could not fully control all external variables, but could still measure the effect of the treatment of the STAD learning model on students' thematic learning outcomes (Sugiyono: 2022). The research design used is One Group Pretest-Posttest Design, where before treatment, students are given an initial test (pretest) to measure initial ability, then after learning using the STAD model, students are given a final test (posttest) to find out if there are changes in learning outcomes (Arikunto: 2021).

The subjects of this study are all grade III students of SDN 02 Bojong Cikupa Tangerang which totals 25 students. The selection of classes was carried out purposively by considering the heterogeneous characteristics of students and the suitability of the thematic learning conditions in the class with the research objectives (Majid: 2020). The independent variable in this study is the STAD-type cooperative learning model, while the bound variable is the thematic learning outcomes of students (Suhadi: 2022).

The procedure for implementing learning with the STAD model follows the steps developed by Slavin, namely: presentation of material by teachers, formation of heterogeneous study groups and collaborative assignments, individual quizzes, calculation of individual development scores, and awarding awards to groups based on the achievement of the highest score (Slavin: 2019). During the learning process, the researcher conducted observations to observe the implementation of the model and the level of student participation in the group (Hidayati: 2023).

The main instrument used in this study was a multiple-choice test given during the pretest and posttest. The preparation of tests is adjusted to the competency indicators in the 2013 Curriculum. The validity of the content of the instrument was consulted with two lecturers of Elementary Education and one

grade III teacher, while the reliability of the instrument was tested using the KR-20 formula to ensure the consistency of the question items (Ramdani & Harun: 2022; Yusnita: 2022). In addition, supporting instruments such as student activity observation sheets, student response questionnaires to STAD learning, and field notes were used to obtain a more comprehensive picture of the learning process (Rustaman: 2020).

The data collection technique was carried out through learning outcome tests, group activity observations, and student response questionnaires, which as a whole complemented each other so as to strengthen the triangulation of the data in this study (Kusumadewi: 2021). Learning outcome data was analyzed using a paired sample t-test to determine the significance of improving student learning outcomes before and after treatment. Statistical analysis was carried out using the latest version of SPSS software (Indrayanto: 2024). In addition, the N-Gain Score calculation is also used to identify the level of improvement in student learning outcomes whether in the high, medium, or low categories (Hake: 1998 in Suhadi: 2022). Meanwhile, the results of observations and questionnaires were analyzed descriptively quantitatively to see the involvement and response of students to learning with the STAD model.

RESULTS AND DISCUSSION

Results

This study measures the effectiveness of the application of the Students Teams Achievement Division (STAD) type cooperative learning model on improving the thematic learning outcomes of grade III students of SDN 02 Bojong Cikupa Tangerang. The measurement was carried out by comparing *pretest* and *posttest* scores in 25 students as a research sample. *The pretest* is given before the application of the STAD model to determine the initial ability, while *the posttest* is given after the entire series of learning with a cooperative approach is fully implemented.

Based on the results of data analysis, it is known that student learning outcome scores have increased significantly. The average *pretest* score of 65.0 shows that students' initial abilities are still in the sufficient category and have not met the minimum completion target of thematic learning. After being given the STAD learning treatment, the average *posttest score* increased to 76.4, which was in the good category and showed an improvement in the mastery of the material by students. This improvement indicates that students better understand the material through a collaborative process, discussions between

group members, and individual evaluation in the STAD learning model *(Siregar: 2023)*.

In addition, the improvement in learning score was analyzed using the N-Gain Score, where an average score of 0.32 or in the medium category according to the Hake classification (in Suhadi: 2022) *was obtained*. This means that STAD learning provides a moderate increase in effectiveness on students' intellectual ability to understand thematic concepts. The variation in score increase between students also showed that all students experienced an improvement, although with different levels of achievement according to their respective abilities.

To test the significance of the difference in scores before and after treatment, a paired sample t-test was used. The results of the analysis showed a t-count value = 12.77 with a value p = 0.000 which was smaller than $\alpha = 0.05$. Thus, it can be ascertained that there is a statistically significant difference between the learning outcomes before and after the application of the STAD learning model. This shows that the increase in learning outcomes does not occur by chance, but is a direct impact of the implementation of the STAD model (Indrayanto: 2024).

In addition to statistical tests, the data visualization in Figure 1 shows a relatively consistent pattern of improvement in almost all students. The *posttest* score curve that is far above *the pretest* for a large number of students illustrates that group collaboration, positive interdependence, and individual assessment applied in STAD can help students understand the material more meaningfully. These findings reinforce the view that interaction in group activities can improve the process of conceptual elaboration and students' deep understanding (Putri & Mulyono: 2023).

Thus, the overall results of the study show that the STAD-type cooperative learning model contributes significantly to improving student learning outcomes in grade III thematic learning of SDN 02 Bojong Cikupa Tangerang. The application of active, participatory, and collaborative learning strategies has been proven to increase students' motivation, participation, and understanding of thematic concepts more effectively than conventional learning with one-way lectures (Wibawa: 2023).

Discussion

The results of this study show that the *Students Teams Achievement Division* (STAD) type cooperative learning model has a significant influence on improving the thematic learning outcomes of grade III students at SDN 02

Bojong, Cikupa District, Tangerang. The increase occurred because STAD's cooperative learning encourages the development of positive interdependence between students, where each member of the group has a role and responsibility in completing the assigned tasks thus ensuring the contribution of each individual in achieving the group's goals (Slavin: 2019).

The application of STAD allows for the exchange of knowledge in small, heterogeneous groups, so that highly capable students can help their friends who have difficulty understanding the material. This kind of social interaction is an important factor in strengthening students' understanding of concepts and thinking skills because they not only passively receive information, but actively elaborate ideas with their peers (Sani: 2021). The effectiveness of this collaboration is reflected in the increase in average posttest scores and the achievement of the moderate N-Gain category, which shows that the majority of students experience an increase in understanding of thematic concepts through a learning model that is dialogical and participatory (Megawati & Purnomo: 2023).

In addition, in elementary school students, most of whom are still in the concrete operational stage, support from the peer social environment is one of the driving factors in achieving their cognitive and emotional development (Piaget in Andani: 2022). Interaction and discussion in groups provide opportunities for students to dialogue, clarify understanding, and solve problems together, which can ultimately increase motivation, confidence, and enthusiasm for learning (Ngalimun: 2020).

These findings also support the idea that collaboration-based learning can reduce the learning achievement gap between low- and high-ability students. Through the group reward system in the STAD model, all students are motivated to contribute because individual progress has a direct effect on the group's score (Wibawa: 2023). Thus, not only does the understanding of the material increase, but also the character of cooperation, care, and social attitude of students also develops.

More broadly, the results of this study are relevant to the implementation policy of the 2013 Curriculum and the Independent Curriculum which emphasizes the development of high-level thinking, communication, and collaboration skills in thematic learning. The application of the STAD model in the context of SDN 02 Bojong Cikupa Tangerang is empirical evidence that active learning strategies when implemented properly are able to encourage students to learn more meaningfully and independently (Putri & Mulyono: 2023).

Thus, STAD-type cooperative learning has proven to be not only effective in improving learning outcomes, but also a pedagogical approach that is in line with the demands of 21st century competencies and the needs of the development of social and emotional skills of elementary school students.

CONCLUSION

Based on the results of the research on the application of the STAD-type cooperative learning model in thematic learning in grade III of SDN 02 Bojong Cikupa Tangerang, it can be concluded that the STAD model is effective in improving student learning outcomes. This is evidenced by an increase in the average score of learning outcomes from 65.0 in the *pretest* to 76.4 in the *posttest*. In addition, the average N-Gain Score of 0.32 indicates an improvement in the medium category. The results *of the paired sample* t-test yielded a t-value of 12.77 with a p-value of 0.000 ($p < 0.05$), indicating that there was a statistically significant difference between the learning outcomes before and after the treatment.

This improvement in learning outcomes is supported by the implementation of mutually reinforcing group cooperation, individual accountability, social interaction in problem solving, and wider opportunities for all students to be active in the learning process. Thus, the STAD model can be an alternative learning model that is relevant and feasible to be applied in thematic learning in elementary schools, especially in supporting the implementation of the Independent Curriculum which is oriented towards activity-based learning and student collaboration.

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Influence Interaction Semester and Type Sex to Science Learning Outcomes: A Quasi-Experimental Study of Fifth Grade Students in Jakarta

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Abstract

This study aims to analyze the influence of semester, gender, and their interaction on the science learning outcomes of fifth-grade students in Jakarta. The study used a quasi-experimental design with a 2x2 factorial design. The sample consisted of 28 students selected through non-probability sampling, with a balanced composition based on semester and gender. Data were collected using a validated multiple-choice science learning outcome test. The analysis showed that semester significantly influenced science learning outcomes ($F = 4445.354$; $\eta^2 = 0.988$), with higher achievement in the even semester. Gender also had a significant effect ($F = 3965.297$; $\eta^2 = 0.987$), with female students demonstrating higher learning outcomes. Furthermore, there was a significant interaction effect between semester and gender ($F = 5985.992$; $\eta^2 = 0.991$). A Tukey HSD follow-up test showed significant differences between male and female students in the odd semester and between the odd and even semesters for both genders. These findings indicate that the improvement in learning outcomes from the odd to the even semester was greater for female students.

Keywords: Science Learning Outcomes, Semester, Gender, Interaction, Elementary School Students.

Abstrak

Penelitian ini bertujuan menganalisis pengaruh semester, jenis kelamin, dan interaksi keduanya terhadap hasil belajar sains siswa kelas V di Jakarta. Penelitian menggunakan desain quasi-eksperimen dengan rancangan faktorial 2×2. Sampel berjumlah 28 siswa yang dipilih melalui nonprobability sampling, dengan komposisi seimbang berdasarkan semester dan jenis kelamin. Data dikumpulkan melalui tes hasil belajar sains berbentuk pilihan ganda yang tervalidasi. Hasil analisis menunjukkan bahwa semester berpengaruh signifikan terhadap hasil belajar sains ($F = 4445,354$; $\eta^2 = 0,988$), dengan capaian lebih tinggi pada semester genap. Jenis kelamin juga berpengaruh signifikan ($F = 3965,297$; $\eta^2 = 0,987$), di mana siswa perempuan menunjukkan hasil belajar lebih tinggi. Selain itu, terdapat pengaruh interaksi signifikan antara semester dan jenis kelamin ($F = 5985,992$; $\eta^2 = 0,991$). Uji lanjut Tukey HSD menunjukkan perbedaan signifikan antara siswa laki-laki dan perempuan pada semester ganjil serta antara semester ganjil dan genap pada kedua jenis kelamin. Temuan ini menunjukkan bahwa peningkatan hasil belajar dari semester ganjil ke semester genap lebih besar pada siswa perempuan.

Kata Kunci: Hasil Belajar Sains, Semester, Jenis Kelamin, Interaksi, Siswa Sekolah Dasar.

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INTRODUCTION

Education is a conscious and planned effort aimed at developing human potential holistically, encompassing physical, spiritual, intellectual, and social aspects, in order to improve the quality of life for individuals and society (Whitehead, 2024). In the context of formal education, science is one of the core subjects that plays a vital role in equipping student with knowledge base about natural universe as well as ability think logical, critical, and scientific since elementary school level (Amelia et al., 2025; Susanti et al., 2025; Hariyanti et al., 2024).

Students' science learning outcomes are influenced by various factors, both internal and external. Factor internal covers characteristics individual like motivation, ability beginning, and types sex, whereas factor external covering environment Study, method learning, and time or period learning (Fernando et al., 2024; Siregar, 2024). In between various Of these factors, gender and semester of study are two variables that are often studied because they have significant potential to influence students' academic achievement.

Gender is often associated with differences in learning styles, interests, motivation, and cognitive strategies in understand the material lessons (Rahmi et al., 2024). Meanwhile, the semester as representation time learning own characteristics Which different, Good from aspect material load, students' psychological conditions, and the learning strategies implemented by teachers. The odd semester is generally an adaptation phase after a long holiday, while the even semester often time functioning as period consolidation And evaluation end year (Amrulloh et al., 2024; Hasan et al., 2024).

More carry on, interaction between type sex And semester allows emergence partially unexplained combined effect. The learning performance of male and female students can show variation Which different on every semester, influenced by psychological and social factors, as well as suitability for the learning methods and materials used (Ningsih et al., 2024; Istiningsih, 2024; Aprilia, 2024). By Because That, study about The interaction of these two variables is important to obtain a more comprehensive picture of the determinants of students' science learning outcomes.

However, based on the results of the literature review, research specifically examining the interaction between semester and gender on elementary school students' science learning outcomes is still relatively limited.

Most previous studies have examined the effects of gender or semester separately, without examining both simultaneously (Listiani et al., 2025; Rachman, 2024; Lestari, 2025; Susanti et al., 2025). This limitation indicates a research gap that needs to be filled.

Based on these conditions, this study aims to analyze the influence of semester, type of sex, as well as interaction both of them to results Study science student class V school base in Jakarta. The research results are expected to provide theoretical contributions to the development of research studies. results Study science as well as contribution practical for Teacher And stakeholders interest education in designing learning strategies that are more adaptive, effective, and responsive to student characteristics.

METHOD

1. Research Design and Approach

This study employed a quantitative research approach using a quasi-experimental method with a 2 × 2 factorial design. This design was selected because the study involved two independent variables—semester (odd and even) and gender (male and female)—and one dependent variable, namely students' science learning outcomes. The factorial design enabled the analysis of both the main effects of each independent variable and their interaction effect on learning outcomes.

2. Population and Sample

The population of this study consisted of all fifth-grade students of SDN Ulujami 02 Pesanggrahan, South Jakarta, during the 2024/2025 academic year, totaling 48 students. The sample was selected using a non-probability sampling technique by considering the equivalence of curriculum implementation, learning facilities, and teacher background. Based on these considerations, a total of 28 students were selected as research participants, consisting of students from both odd and even semesters with a balanced distribution of male and female students.

Using a 2 × 2 factorial design, the study involved two independent variables, each with two levels, resulting in four experimental groups. The distribution of participants in each group is presented in Table 1.

Table 1. Factorial Design Grouping

Factor B (Gender)	A1 (Odd Semester)	A2 (Even Semester)
B1 (Male)	A1B1	A2B1
B2 (Female)	A1B2	A2B2

Each group consisted of seven students, resulting in the sample distribution shown in Table 2.

Table 2. Sample Distribution

Semester	Male	Female	Total
Odd	7	7	14
Even	7	7	14
Total	14	14	28

3. Research Variables

The variables in this study are defined as follows:
- **Independent Variables:**
    - Semester (odd and even)
    - Gender (male and female)
- **Dependent Variable:**
    - Students' science learning outcomes

4. Data Collection Techniques

Data were collected using the following instruments: a. **Learning Outcome Test:** A multiple-choice test designed to measure students' science learning outcomes. The instrument was validated and tested for reliability prior to use. b. **Documentation:** Official school records were used to obtain data related to students' gender and semester classification.

5. Data Analysis Techniques

The collected data were analyzed using inferential statistics, specifically a two-way analysis of variance (Two-Way ANOVA) based on a 2 × 2 factorial design. This analysis was conducted to examine:
1. The main effect of semester on science learning outcomes,
2. The main effect of gender on science learning outcomes, and
3. The interaction effect between semester and gender on science learning outcomes.

Before conducting the ANOVA, prerequisite tests were performed to ensure data suitability, including:
1. **Normality Test:** Using the Shapiro–Wilk test at a significance level of 0.05 ($\alpha = 0.05$).
2. **Homogeneity of Variance Test:** Using Bartlett's test at a significance level of 0.05 ($\alpha = 0.05$).

Only data that met these assumptions were included in the subsequent ANOVA analysis.

RESULTS AND DISCUSSION

Results

This study was conducted to determine the influence of semester, gender, and the interaction of the two on the science learning outcomes of grade V elementary school students in Jakarta. The data obtained was analyzed using the two-way ANOVA test. The following are the findings based on data processing:

1. Description of Science Learning Outcomes Data

Here is data on science learning outcomes by semester and gender:

Table 3. Description of Student Science Score Statistics

Statistics	A1B1	A2B1	A1B1	A2B2
Mode	70	90	79	90
Median	74	90	79	87.5
Red	75.000	86.786	81.071	85.571
Std. Deviation	5.87	4.87	4.411	5.185
Variance	34.46	23.72	19.456	26.879
Shapiro-Wilk	0.782	0.659	0.653	0.811
P-value of Shapiro-Wilk	0.003	<.001	<.001	0.007
Minimum	70	78	78	76
Maximum	89	90	90	90

Table 3 above shows that the odd semester student group of women (A_{1B2}) had the highest science score of the other group with a mean of 86,786 and the group of odd semester students of men (A_{1B1}) had the lowest science score of the other group with an average (mean) of 75,000

2. Analysis Prerequisites Test

a. Normality Test

For the Shapiro-Wilk test based on table 3 of the 7th row above the overall group with a p-value of < 0.05, this shows that the data is not normally distributed.

b. Variance Homogeneity Test with Barlett Test

Table 4. Variance Homogeneity Test

Groups	db	S2	Log S2	db. Log S2	db (S^2)
A1B1	13	34.46	1.53731527	19.9850986	447.98
A2B1	13	23.72	1.37511468	17.8764909	308.36
A1B2	13	19.456	1.28905356	16.7576962	252.928
A2B2	13	26.879	1.42941311	18.5823704	349.427
Jml	52	104.515		73.2016	1358.7

Calculation:

$$s^2 G = \frac{\sum db\,(S^2)}{db} = \frac{1358.7}{52} = 26.128$$

B = log $s^2 G$ $\sum$db = (log 26.128)(52) = (1.417) (52) = 73.684

$\chi2$ count = (lon 10) (B - $\sum$ db. Log S2) = (2.3026) (73.2684) - (73.2016)

= 0.153

So the value χ^2 count = 0.153 compared to χ^2 table for α 0.05 and db =3 is obtained 7.82. Since χ^2 count = 0.153 < $\chi2$ table = 7.82, thus the four data groups have the same or homogeneous variance.

Table 5. Two Way ANOVA

Variant source	JK	db	RJK	Calculation	Ftable (α; 0.05)	η2
Antar A	116152.678	1	116152.678	4445.354	7.03	0.988
Antar B	103609.250	1	103609.250	3965.297	7.03	0.987
Antar AB	156408.000	1	156408.000	5985.992	7.03	0.991
In	1358.714	52	26.129			
Total	-	-	-	-	-	-

Statistical hypotheses;

H0 : µA1 ≥ µA2   H0 : µb1 ≥ µb2   H0 : A xB = 0

H1 : µA1 ≤ µA2   H1 : µb1 ≤ µb2   H1 : A xB ≠ 0

Interpretation of Results:

a. The Influence of Semester (A) on Students' Science Learning Outcomes

In table 6 above for the semester variable (A) shows the value of F calculated as > F table 4445.354 > 7.03 at a significant level of 5% thus receiving H0 , meaning

that the semester has a significant effect on the science learning outcomes of students. A value of η^2 (Eta Square) of 0.988 indicates that semester (A) accounts for 98.8% of the total variation in learning outcomes, which means that the contribution of semester (A) is very large to the science learning outcomes of grade V students in Jakarta

b. Influence of Gender (B) on Students' Science Learning Outcomes

In table 6 above for gender (B) shows the value of $F_{calculated}$ as $> F_{table}$ 3965.297 > 7.03 at a significant level of 5% thus receiving H_0, meaning that gender (B) has a significant effect on students' science learning outcomes. A value of η^2 (*Eta Square*) of 0.987 indicates that gender (B) explains 98.7% of the total variation in learning outcomes, which means that the contribution of gender (B) is very large to the science learning outcomes of grade V students in Jakarta

c. Effect of Semester x Gender Interaction (A x B)

In table 6 above, the value of $F_{calculating}$ the interaction between semester (A) and gender (B) 5985,992 > 7.03 at a significant level of 5 % thus receiving H_0, meaning that the interaction of semester x gender (A x B) has a significant effect on students' science learning outcomes. With a value of η^2 of 0.991, the interaction of semester x gender (A x B) accounted for 99.1% of the total variation in science learning outcomes, indicating that the interaction had the greatest influence between semesters and students' gender on the science learning outcomes of grade V students in Jakarta

3. Further Test (*Post Hoc Tukey HSD*)

Post hoc testing is a special finding outside of the proposed objectives and hypotheses. The purpose of this test is to complement the general purpose of the research and also so that the school or teachers can be used as recommendation material in learning activities, especially science lessons as follows:

a. Comparison of Group A_1B_1 vs A2B1

Post hoc test Tukey HSD to find out which group is significantly different with the condition of accepting H_0 if the value $t_{is\ calculated} \geq t_{table}$ at a 5% error level.

$$t_{hitung\ A1B1\ VS\ A2B1} = \frac{\overline{y_1} - \overline{y_2}}{\sqrt{RJK(\text{D(galat)})\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}} = \frac{75.000 - 86.785}{\sqrt{(26.641)\left[\frac{1}{14} + \frac{1}{14}\right]}} = \frac{-11.785}{1.950} = 6{,}043$$

Statistical Interpretation:

The results of Tukey HSD's follow-up test showed a significant difference between the A1B1 group (odd-semester male students) and A2B1 (even-semester male students). The average score of learning outcomes for the A1B1 group was 75.00, while the A2B1 group was 86.785.

The calculated t-value obtained was −6.038, which indicates that the average learning outcomes of male students in odd semesters were lower compared to male students in even semesters. With a free degree of 26 and a significance level of 0.05, a table value of 1.706 was obtained. Since the calculated absolute value < is greater than the table (−6.038 > 1.706), the difference between the two groups is statistically significant.

Thus, it can be concluded that the learning semester has an effect on the science learning outcomes of male students, where the learning outcomes in even semesters are higher than in odd semesters.

b. Comparison of Group A_{1B2} vs A2B2

$$t_{hitung\ A1B2\ VS\ A2B2} = \frac{\overline{y_1} - \overline{y_2}}{\sqrt{RJK(\text{D(galat)}) \left[\frac{1}{n_1} + \frac{1}{n_2}\right]}} = \frac{81.071 - 85.571}{\sqrt{(26.641) \left[\frac{1}{14} + \frac{1}{14}\right]}} = -\frac{-4.500}{1.950} = 2{,}307$$

Statistical Interpretation:

The results of Tukey HSD's follow-up test showed a significant difference between the A1B2 group (odd-semester female students) and A2B2 (even semester female students). The average score of science learning outcomes for the A1B2 group was 81.07, while the A2B2 group was 85.57.

The calculated t-value of −2.307 indicates that the average learning outcomes of female students in odd semesters are lower than those of female students in even semesters. With a free degree of 26 and a significance level of 0.05, a table t-value of 1.706 was obtained. Since the absolute value of $t_{is\ calculated}$ to be greater than the t_{table} (−2.307 > 1.706), the difference between the two groups is statistically significant.

Thus, it can be concluded that the learning semester has an effect on the science learning outcomes of female students, where the learning outcomes in even semesters are higher than in odd semesters.

c. Comparison of Group A_{1B1} vs A1B2

$$t_{hitung\ A1B1\ VS\ A1B2} = \frac{\overline{y_1} - \overline{y_2}}{\sqrt{RJK(\text{D(galat)}) \left[\frac{1}{n_1} + \frac{1}{n_2}\right]}} = \frac{75.000 - 81.071}{\sqrt{(26.641) \left[\frac{1}{14} + \frac{1}{14}\right]}} = = -\frac{-6.071}{1.950} 3.113$$

Statistical Interpretation:

The results of Tukey HSD's follow-up test showed a significant difference between the A1B1 group (odd-semester male students) and A1B2 (odd-semester female students). The average score of science learning outcomes in the A1B1 group was 75.00, while the A1B2 group was 81.07.

The calculated t-value of −3.113 indicates that the average learning outcomes of male students in the odd semester are lower than those of female students in the same semester. With a free degree of 26 and a significance level of 0.05, a table t-value of 1.706 was obtained. Since the absolute value of $t_{is\ calculated}$ to be greater than the t_{table} (−3.113 > 1.706), the difference between the two groups is statistically significant.

Thus, it can be concluded that in odd semesters there is a difference in science learning outcomes based on gender, where female students show higher learning outcomes than male students.

d. Comparison of Group A2B1 vs A2B2

$$t_{hitung\ A2B1\ VS\ A2B2} = \frac{\overline{y_1} - \overline{y_2}}{\sqrt{RJK(\text{D(galat)}) \left[\frac{1}{n_1} + \frac{1}{n_2}\right]}} = \frac{86.785 - 85.571}{\sqrt{(26.641) \left[\frac{1}{14} + \frac{1}{14}\right]}} = = \frac{-1.214}{1.950} 0.622$$

Statistical Interpretation:

The results of the Tukey HSD follow-up test showed that there was no significant difference between the A2B1 group (even semester male students) and A2B2 (even semester female students). The average score of science learning outcomes for the A2B1 group was 86.79, while the A2B2 group was 85.57.

The calculated t-value of 0.622 shows that the average learning outcomes of male students in even semesters are slightly higher than those of female students. However, with a free degree of 26 and a significance level of 0.05, a table t-value of 1.706 was obtained. Because the $t_{\text{-value of the calculation}}$ is smaller than the t_{table} (0.622 < 1.706), the difference between the two groups is not statistically significant.

Thus, it can be concluded that in the even semester there is no difference in science learning outcomes based on gender, because both male and female students show relatively equal learning outcomes.

Discussion

The results of the study showed that semester, gender, and interaction between the two had a significant effect on the science learning outcomes of grade V students in Jakarta. These findings confirm that science learning

outcomes are not only influenced by one factor separately, but also by a combination of learning time characteristics and individual student characteristics. The discussion of each finding is described as follows.

1. The Influence of Semester on Science Learning Outcomes

The results of the analysis showed that students' science learning outcomes in even semesters were significantly higher compared to odd semesters. This finding can be explained through the difference in learning characteristics in each semester. In even semesters, students generally have gone through the adaptation phase to the learning environment, materials, and teachers' teaching styles, so that learning readiness becomes more optimal.

The results of this study are in line with the findings of Kurniawati et al. (2025) who stated that each semester has a different duration, material load, and academic pressure, so that the physical and psychological conditions of students also vary. In addition, odd semesters often function as a transition period after long holidays, while even semesters are more oriented towards consolidating and evaluating learning outcomes (Puspita & Sugiyanto, 2025). These differences in characteristics have direct implications for students' learning readiness and academic achievement (Lestari & Mahrus, 2025; Purwoka, 2025). Thus, the timing of learning implementation (semester) is an important factor that contributes to the temporal variation of students' science learning outcomes.

2. The Influence of Gender on Science Learning Outcomes

The results of the analysis also showed that female students had higher science learning outcomes than male students, both in odd semesters and even semesters. These findings indicate that there are differences in learning characteristics based on gender that affect students' academic achievement.

Empirically, the results of this study support a number of previous studies that suggest that female students tend to have a more verbal and reflective learning style, and are more comfortable with reading, writing, and discussion activities (Fitriansyah & Adi, 2025; Cahyana & Masithoh, 2025). In addition, female students generally pay more attention to the learning process in detail in communicating (Sultan & Jariah, 2025), have learning motivation that is influenced by personal responsibility and satisfaction (Driandra et al., 2025), and

show a higher level of discipline and consistency in completing academic tasks (Bahri & Nugroho, 2025).

These findings also provide a critical perspective on some of the results of previous research that stated that male students excel in mathematics and science, while female students excel in language (Meilinda et al., 2025; Cahyani & Friyatmi, 2025). In the context of this study, the superiority of female students in science learning outcomes shows that differences in academic achievement are not universal, but are greatly influenced by the learning context and characteristics of students. These results are consistent with the view of Hyde and Linn (2006) who stated that the difference in cognitive abilities between boys and girls is relatively small, but in primary education, female students often show academic excellence due to social influences and more stable learning styles.

3. The Effect of Interaction between Semester and Gender on Science Learning Outcomes

The results of the study also showed that there was a significant influence of interaction between semester and gender on science learning outcomes. These findings indicate that the influence of semesters on learning outcomes is not uniform, but varies based on the gender of the students. In particular, the increase in learning outcomes from odd semesters to even semesters was greater in female students than in male students.

These findings reinforce the view that the effectiveness of learning time cannot be separated from individual characteristics of students. Variations in academic pressure, psychological readiness, and evaluation demands in each semester can interact with students' learning styles, motivation, and discipline levels based on gender (Kurniawati et al., 2025; Puspita & Sugiyanto, 2025). Therefore, semester as a learning period is an important factor in explaining temporal variations in learning outcomes (Lestari & Mahrus, 2025; Purwoka, 2025).

In addition, the results of this study are in line with the findings of Anjani et al. (2025) who affirm that gender is a significant variable in educational studies because it affects the way of learning, the speed of understanding, and students' interest in certain subjects. Thus, the interaction between semester and gender

provides a more comprehensive picture of the dynamics of science learning outcomes of elementary school students.

CONCLUSION

This study demonstrates that both semester and gender significantly affect the science learning outcomes of fifth-grade students in Jakarta. Students in even semesters achieve higher learning outcomes than those in odd semesters, indicating that learning timing plays an important role in students' academic readiness. In addition, female students outperform male students in science achievement, suggesting that differences in learning strategies, motivation, and accuracy contribute to achievement disparities. Importantly, the interaction between semester and gender is also significant, indicating that the effect of semester on learning outcomes varies by gender, and vice versa. These findings highlight the necessity of instructional approaches that simultaneously consider temporal factors and gender-based learner characteristics to improve science learning effectiveness.

Based on these findings, it is recommended that teachers adopt adaptive and gender-responsive instructional strategies, particularly during odd semesters, by emphasizing learning orientation and adjustment activities. Schools should implement regular semester-based evaluations and provide continuous professional development focused on inclusive and differentiated instruction. Parental involvement is also essential, especially in supporting students' learning adaptation at the beginning of the academic term. Future research is encouraged to expand the sample size and explore additional interacting variables, such as instructional methods, learning motivation, and parental support, to enhance the generalizability and depth of these findings.

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