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The Effect Of Synergetic Teaching Method oj Students' Logical and Mathematical Thinking Abilities on Social Arithmetics Material In Grade VII

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Abstract

This study aims to determine the effect of the Synergistic Teaching method on students' logical mathematical thinking ability in the Social Arithmetic material of grade VII at SMP Negeri 1 Berampu in the 2025/2026 academic year, and to measure the magnitude of the influence. The research method used is quantitative with a simple linear regression approach. Based on the results of the analysis, the average value of students' logical mathematical thinking ability is 80.5, with the lowest value being 50 and the highest value being 100, which is included in the "good" category. Observations on the application of the Synergistic Teaching method show an average value of 83.667, also categorized as good. The resulting regression equation is $\hat{Y} = 19.929 + 0.724X$, which indicates a positive relationship between the two variables. The results of the F test show that F count > F table (15.357 > 4.2), so H_0 is rejected and H_a is accepted, meaning that there is a significant influence of the Synergistic Teaching method on students' logical mathematical thinking ability. The correlation coefficient r = 0.634 shows a fairly strong relationship, and the t-test also shows tcount > ttable (4.338 > 1.701). Therefore, it can be concluded that the Synergistic Teaching method has a significant influence on students' logical mathematical thinking abilities in the Social Arithmetic material.

Kata Kunci: *Synergistic Teaching, logical mathematical thinking ability, Social Arithmetic.*

INTRODUCTION

Education is a crucial aspect of human life, enabling change and development in various fields. It also fosters individuals with quality, character, and extensive knowledge to achieve desired goals. Mathematics is a crucial field of study in education, as it is taught at all levels, from elementary school to university (Rohendi, 2024) .

According to Fauzi (in Simarmata, 2022) mathematics learning is one of the subjects taught at every level of education, starting from Elementary School (SD), Middle School (SMP), High School (SMA) to university, which aims to equip students with problem-solving skills.

According to Aksu and Koruklu (Asnidar & Sari, 2024) Thinking is a dialectical process, meaning that while we are thinking, our minds are in a state of question and answer

to be able to establish relationships between our knowledge. According to Bumen (Hendrayani et al., 2021) , logistical thinking is the skill to demonstrate behaviors such as using numbers effectively, generating scientific solutions to problems, identifying relationships between concepts, classifying, generalizing, implementing mathematical formulas, calculations, hypotheses, testing, and drawing analogies. One important aspect of mathematical thinking that needs to be possessed is the ability to think logically. The ability to think logically plays an important role in understanding how to solve mathematical problems. (Rahmawati, warmi, 2023) .

However, students' logical thinking abilities are still problematic, as seen when students have difficulty drawing conclusions based on the data in math problems (Azain, 2024) . Several factors contributing to students' low mathematical logical thinking abilities are identified, including a lack of understanding of the concepts/materials provided by teachers to solve logical thinking problems, and a lack of careful reading of what is known and asked in logical thinking problems. To support this, appropriate methods or steps are needed to help students improve their logical thinking abilities. According to Fred Percival and Henry Elington (Boti et al., 2021), Method is a common way to convey lessons to students or teach theories that have been learned in order to achieve learning objectives. (Rizky & Sritresna, 2021) . A similar opinion was expressed by Tardif in Muhibbin Syah, who defined a method as a method containing standard procedures for presenting lesson material to students. A method is a common way to deliver lessons to students or transmit learned theories in order to achieve learning objectives (Herutomo & Masrianingsih, 2019) .

According to Azain (Amalia, Hasanuddin, Khairil, Supriatno, & Andayani, 2021) Synergetic Teaching learning method is a method that combines two learning methods, namely conventional learning methods (lecture methods) and independent learning which aims to enable students to compare notes and find learning outcomes with the same material but different learning experiences. According to Soleha (2024) the Synergetic Teaching strategy is a learning method that aims to encourage active student involvement in the learning process. According to Hendrayani et al., the characteristics of the Synergetic Teaching method are: 1) student-centered 2) the teaching process prioritizes providing direct experience and, 3) the separation between fields of study is not clearly visible. Based on these characteristics, it shows that the Synergetic Teaching method is a student-centered learning method that is in accordance with the existing cycle, namely the 2013 cycle which requires students to play a role in active learning. This approach provides opportunities for students to exchange learning outcomes on similar topics, but through different approaches, through the comparative notes they make. (Ainunnisa et al., 2021) . During learning using this method, students are actively engaged from beginning to end. This method also makes it easier for students to understand the material by sharing learning experiences and can help other students understand what they are explaining (Achmad Ali Fikri, Syamsul Arifin, 2022) .

Social arithmetic is a branch of mathematics that is highly relevant to various complex problems in social dynamics, so it is important to show students how useful this material is in life. One material that can be carried into everyday life is social arithmetic (Adia, 2023) . "One of the topics of mathematics that is considered difficult and sometimes leaves students confused, both regarding the material and the problems is about social arithmetic. Social arithmetic is a part of mathematics that discusses financial calculations in trade and everyday life and its aspects. In line with research conducted by Sari, Susanti, & Rahayu (Musni, 2024) that "Students' errors in working on social arithmetic problems are errors in rewriting available information, errors in creating mathematical models, and errors in carrying out operations on integers and decimals." (Arfin et al., 2023) .

Through interviews conducted by researchers with the school, namely with the mathematics teaching staff at SMP Negeri 1 Berampu, namely Diana Silalahi, it turns out that there are still many seventh grade students at the school who have difficulty working on social arithmetic problems, especially things that are still basic material, namely those related to selling prices and buying prices as well as the percentage of profit and loss (Robiah & Nuraeni, 2023) . This is known from student learning outcomes, where students' lack of logical thinking skills in concluding what is the problem in the arithmetic problem. Based on the description above, a study was conducted with the title "The Effect of the Synergetic Teaching Method on Students' Mathematical Logical Thinking Skills on Social Arithmetic Material for Grade VII at SMP Negeri 1 Berampu in the 2025/2026 Academic Year"

METHOD

The type of research used is quantitative research using a quasi-experimental method to determine the effect of the Synergetic Teaching Method on students' logical mathematical thinking abilities. According to Sugiyono (Mulyani, 2023) , quasi-experimental research is a way to find a causal relationship between two or more variables that are intentionally created, but does not function fully to control external variables that affect the implementation of the experiment because it is difficult to obtain a control group used for research.

The design used in this study is Post-test Group Design. This study involved only one class and the class was said to be an experimental class. This research will be conducted at SMP Negeri 1 Berampu. This school is located at Jalan Parongil No.X, Berampu District, Dairi Regency, North Sumatra (Subakti et al., 2021) . This research will be conducted in the Odd Semester of the 2025/2026 Academic Year. Population is a collection or the whole of all objects or research subjects that have certain characteristics to be studied and conclusions drawn (Fortuna et al., 2022) . Thus, the population does not only refer to humans, but also includes objects that are the focus of the research. The population includes all characteristics or traits possessed by the subject. The population in this study were grade VII students of SMP Negeri 1 Berampu, Berampu District, Dairi Regency, which consists of six classes (Wulandari & Fatmahanik, 2020) .

From all the seventh grade students of SMP Negeri 1 Berampu, Berampu District, Dairi Regency, one class was selected as a sample. The technique used in this study was simple random sampling, meaning that each member of the population has an equal opportunity to be selected as a sample (Utami, 2021) . From all seventh grade students at SMP Negeri 1 Berampu, one class was selected as a sample, namely class VII with a total of 30 students.

In general, the purpose of basic data analysis is to present data so that it is easier to understand and ultimately leads to a conclusion. After that, a conclusion from the data analysis obtained from the sample is generally made based on hypothesis testing or point guesses to analyze data from the Synergetic Teaching method (X) and data on logical mathematical thinking skills (Y) from the research results using descriptive statistics, namely describing, recording, and analyzing data (Arrum et al., 2021) .

RESULTS AND DISCUSSION

The study was conducted from July 29, 2025, to August 12, 2019. This study was conducted in four meetings according to the teaching module, with three meetings for learning activities and one meeting for the final test or post-test. The time allocation for each meeting was 2 x 45 minutes.

Prior to data collection, the data collection instrument (post-test questions) was first tested in class VIII-1 of SMP Negeri 1 Berampu with 30 students. The trial was conducted to determine the validity, reliability, level of question difficulty, and question discrimination power (Afifah et al., 2023) .

One indicator of a quality test is the ability to accurately measure what should be measured, or what is called validity (Sari et al., 2018) . The conditions that must be met for the question to be valid are that rhitung>rtable with rtable known to be 0.361. This validity test uses SPSS through a person correlation test and can be seen in Appendix (10) below are the results of the validity test to test students' logical mathematical thinking abilities.

Table 1. Results of Variance Analysis Calculations on Students' Mathematical Logical Thinking Ability

Source of Variance	Dk (n)	Sum of Squares	Average sump	F counts
Total	30	Jakarta	RKT	-
Regression(α)	1	$JK_{Reg\ a}$194407.5		
Regression($b\|a$)	1	$JK(b\|a) = 2361{,}6$	$S^2{}_{Reg}$=2361.6	$F_1 = \frac{S^2{}_{Reg}}{S^2{}_{Res}} = \frac{2361{,}6}{153{,}782} = 15{,}357$
Residue	28	$JK_{Res} = 4305{,}9$	$S^2{}_{Res}$ =153,782	
Tuna Match	10 – 2 = 8	JK(TC)=1097.567	$S^2{}_{TC} = 137{,}196$	

Mistake	30 – 10 = 20	JK(E) =3208.333	$S^2{}_E = 160{,}417$	$F_2 = \frac{S^2{}_{TC}}{S^2{}_E} = \frac{137{,}196}{160{,}417} = 0{,}855$

Regression Linearity Test

Ho: There is no linear influence between the *Synergetic method Teaching* students' mathematical logical thinking skills.

Ha: There is a linear influence between *the Synergetic Teaching method* and students' mathematical logical thinking abilities.

Testing criteria:

$F_{count} \geq F_{table}$, then $H0_{is}$ accepted and Ha_{is} rejected

$F_{count} < F_{table}$, then $H0_{is}$ rejected or Ha_{is} accepted

From the calculation results that we can see in the attachment (23) and we relate it to the F distribution list, we can see that $F_{table} = 2.45$. From this we can know that $F_{count} < F_{table}$ or 0.885 < 2.45, so Ha is accepted. So we can conclude that there is a linear relationship between *the Synergetic Teaching Method* and students' logical mathematical thinking.

Regression Significance Test

Ho: The regression model is not meaningful

Ha : Regression Model means

To test the null hypothesis, the calculated F statistic is used $= \frac{S^2_{reg}}{S^2_{res}}$ (Sudjana, 2009: 327). Compared with the F table with the numerator dk = 1 and the denominator dk = n-2. To test the null hypothesis, the criteria are:

Accept Ho, if $F_{Count} < F_{Table}$

Accept Ha, if $F_{Count} \geq F_{Table}$

Based on the ANOVA table in attachment (22) and attachment (24), it is obtained: $F_{count} > F_{table}$ or 15.357 > 4.2 then H_0 is accepted. Thus, it can be concluded that there is a significant regression between the *Synergetic Teaching method* and students' mathematical logical thinking abilities.

relation coefficient

The correlation coefficient test was conducted to determine how strong the relationship between the Synergetic Teaching Method (X) and students' logical mathematical thinking abilities (Y) was using the *Product Moment formula* (Anugraheni & Sartono, 2022) .

Based on the calculation results as in attachment (25), the correlation coefficient of the *Synergetic Teaching learning method* (Y) was obtained as 0.40 ≤ 0.634 <0.70. So it can be concluded that there is a fairly strong relationship between the *Synergetic Teaching method* and students' mathematical logical thinking abilities.

Test of Significance of Correlation Coefficient

H $_0$: There is no significant relationship between *the Synergetic Teaching method* and students' mathematical logical thinking abilities.

H $_a$: There is a significant relationship between the *Synergetic Teaching method* and students' mathematical logical thinking abilities.

Accept Ho, if t $_{Count}$ < t $_{Table}$

Accept Ha, if t $_{Count}$ > t $_{Table}$

$_{calculated}$ t value is compared with the t $_{table\ value}$. For a two-tailed test at a significance level of 5%, dk = n - 2 = 30 - 2 = 28, then the t $_{table\ value}$ = 1.701. It turns out that the $_{calculated\ t\ value}$ is greater than the t $_{table\ value}$, namely 4.338 > 1.701 so that H0 $_{is}$ rejected and H0 $_{is\ accepted}$, we can see in the appendix (26) Here, the $_{calculated\ t\ value}$ is significant, so it is concluded that there is a meaningful relationship between the *Synergetic Teaching method* and students' mathematical logical thinking abilities (Rojabiah, 2021) .

Coefficient of Determination

To determine the magnitude of the influence between the *Synergetic Teaching method* on students' logical mathematical thinking abilities in appendix (27). Based on the results of the coefficient of determination on the relationship between X and Y, the results obtained are ( ) = 35.41%, which in this case means the influence is quite significant. Therefore, it can be obtained that the magnitude of the influence of r^2*the Synergetic Teaching group* learning method on students' logical mathematical thinking abilities is 35.41%.

Research Discussion

Based on the formulation of research results obtained by researchers, where the *Synergetic Teaching method* is applied to class VII of SMP Negeri 1 Berampu where this method divides students into 2 groups where group members can be selected randomly or by other methods, in this method the researcher only acts as a facilitator or director in the learning activities. On the first day of my research, the first thing I did was conduct an instrument test in class VIII-1 of SMP Negeri 1 Berampu, which is in chapter 1, after that I entered class VII-1, the class that was my research, then I started learning with the Synergetic Teaching method, after that I gave LKPD to each group. At the second meeting I did the same thing in class VII-1 then at the third meeting which coincided with the national holiday which commemorated Indonesian independence, namely August 17, we only studied for 1 hour because students would play the OSIS league match. At the fourth meeting I conducted a post-test in class VII-1. If there is an influence between the *Synergetic Teaching method* on mathematical logical thinking skills, it can be concluded that the model is influential. Based on the average learning outcomes of students' mathematical logical thinking abilities using the *Synergetic Teaching method,* the lowest score was 50 and the highest score was 100 80,5 (Samad et al., 2021) . This indicates that the results of students' mathematical problem-solving abilities are included in the good category. Meanwhile, for student observations with the *Synergetic Teaching method* , the average was 83,667 with the

lowest score of 68 and the highest score of 100. This indicates that the *Synergetic Teaching method* was implemented well (Kurnia Putri et al., 2019) .

Based on the results of the regression analysis calculations, the regression equation for mathematical logistical thinking ability is obtained, namely: $\hat{Y} = 19.929 + 0.724X$ In the regression equation of the ability, the b value is obtained with a positive sign, meaning that the two variables have a positive linear relationship. From the significance test of the regression on students' mathematical logistical thinking abilities, the $_{calculated} > F_{table}$ or 15.357> 4.2 is obtained, so Ho is rejected and Ha is accepted so that the X variable has an influence on the Y variable or there is an influence between the *Synergetic Teaching method* on students' mathematical logistical thinking abilities (Situmorang, 2018) . Based on the results of the calculation of the correlation coefficient on students' mathematical logistical thinking abilities, r = 0.634 is obtained, which means that there is a sufficient relationship between the *Synergetic Teaching method* and students' mathematical logical thinking abilities. Based on the results of the calculation of the significance test of the correlation coefficient obtained $t_{count} > t_{table}$ or 4.338> 1.701, which means that there is a fairly strong relationship between the *Synergetic Teaching method* and students' mathematical logical thinking abilities. And based on the results of the coefficient of determination is 35.41%, meaning that the influence that occurs is quite significant.

From the results of the discussion, the hypothesis in this study is accepted, namely that there is an influence of the *Synergetic Teaching Method* on the logical mathematical thinking abilities of Class VII students at SMP Negeri 1 Berampu in the 2025/2026 academic year and its influence is quite strong on students' logical mathematical thinking abilities.

CONCLUSION

From the results of research conducted by researchers in class VII of SMP Negeri 1 Berampu in the 2025/2026 academic year, it can be concluded that:

1. *The Synergetic Teaching* method has an influence on students' logical mathematical thinking abilities in Social Arithmetic material.
2. *The Synergetic Teaching* method has a strong influence on students' logical mathematical thinking abilities.

Suggestion

Based on the results and conclusions of this study, the researcher would like to provide the following suggestions:

1. Teachers can choose the *Synergetic Teaching learning method* to improve students' mathematical logical thinking skills.
2. In using this method, it is very capable of forming good cooperative characters between students both individually and in groups.

3. The teacher suggested providing a more interesting and comfortable place to open students' mindsets in implementing this method, so that students do not get bored in doing the tasks that will be given.
4. It is recommended that future researchers use more diverse evaluation instruments such as interviews or questionnaires to obtain a more in-depth picture of students' mathematical logical thinking abilities.

Further research can consider other factors that influence learning, such as student learning motivation, academic background, or the use of technology in learning

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