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The Influence of the Inside Outside Circle (IOC) Cooperative Learning Model on Students' Mathematics Learning Activity

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ABSTRACT

This study aims to determine the effect of the Inside Outside Circle (IOC) cooperative learning model on students' mathematics learning activity. This study is a pre-experimental study with a Posttest Only Control Group Design. The sample population of the study was all seventh grade students, with class VII.1 as the experimental class and VII.2 as the control class selected through a simple random sampling technique. The instrument used was a learning activity questionnaire, and the data were analyzed through normality, homogeneity, and t-test, Independent Sample T-Test. The results showed that the data were normally distributed and homogeneous. Hypothesis testing was carried out using SPSS Software with a significance level of 0.05 so that the results of the hypothesis test found a significance value of 0.035 <0.05, so H_0 was rejected. Thus, it can be concluded that the Inside Outside Circle (IOC) cooperative learning model has a positive effect on the mathematics learning activity of seventh grade students at *SMP Negeri* 6 *Bukittinggi*.

Keywords: Cooperative Learning; Model Type Inside Outside Circle (IOC); Student Learning Activeness; Influence.

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1. INTRODUCTION

Education is a conscious and planned interaction between humans and their environment, aimed at developing their full potential, leading to positive change and progress, both cognitively, affectively, and psychomotorically, continuously, and to achieve life goals (Ulfah et al., 2021). Therefore, the government needs special attention to education in Indonesia to advance the nation and state. This context is reinforced by the opinion (Ginanjar, 2019), who stated that mathematics is a crucial subject in education because it enables students to think logically, rationally, and broadly.

Mathematics comes from the Latin term "mathematike," which originally derived from the Greek term "mathematike," meaning "relating to learning," and is related to the relationship between science and knowledge (Andriliani et al., 2022). Mathematics is a universal science that underlies the development of modern technology and plays a vital role in advancing human thought and various disciplines (Zulmaulida et al., 2024). According to Kurniati (2015), mathematics is the science of numbers, the relationships between numbers, and the operational processes used to solve problems involving numbers.

Mathematics is a branch of science, meaning it is knowledge acquired through the learning process. According to Sari & Putri (2024), mathematics learning is a teaching and learning process developed by teachers to develop students' creative thinking and enhance their ability to construct new knowledge as an effort to improve mastery of mathematical material. Mathematics learning is an interactive process between teachers and students that involves thought patterns and logic in a learning environment intentionally created by the teacher so that students can engage in learning activities effectively and efficiently. According to Arsini et al. (2023), the teacher's role includes being an educator, instructor, guide, and role model for students. Furthermore, teachers also play a role in encouraging student creativity in the teaching and learning process, both inside and outside the classroom (Mulyasa, 2019). One way to improve the quality of mathematics learning is by implementing innovative learning models that are tailored to student characteristics.

Therefore, if a teacher does not use an appropriate model, it can make learning objectives difficult to achieve, resulting in monotony and reduced student engagement. Active participation is a process where students are expected to engage in various learning activities as a response to the material presented by the teacher during the learning process (Prijanto & Kock, 2021). Active learning is a teaching and learning process in which students are intellectually and emotionally involved, enabling them to play a role and actively participate in learning activities. Therefore, active learning requires students to be actively involved and participate in the learning process, thereby changing their behavior (Agustina, 2022).

According to Murni (2021), student activeness in the learning process is crucial because learning can be considered successful and high-quality if all, or at least most, students are physically, mentally, and socially active. Student activeness in the learning process is an important and fundamental issue that must be understood, recognized, and developed by every teacher in the learning process (Imamuddin, Rusdi, et al., 2019). Active learning is student involvement in the learning process with the aim of achieving success in the learning process.

This is reinforced by Government Regulation No. 19 of 2005 concerning National Education Standards, which states that the learning process in an education is conducted interactively, inspiringly, fun, challenging, motivating students to actively participate, and providing sufficient space for initiative, creativity, and independence in accordance with students' talents, interests, and physical and psychological development (Imamuddin, Isnaniah, et al., 2019). From this regulation, it can be concluded that the above statement directly and firmly emphasizes the importance of student activeness in learning, both in terms of participation, initiative, creativity, and personal responsibility. Thus, student active learning can be defined as students' conscious, active, and independent involvement in learning activities, both physically, mentally, and emotionally. This activeness reflects students' enthusiasm for discussions, asking questions, expressing opinions, and seeking solutions to problems encountered during the learning process (Ruslandi et al., 2025).

However, the facts in the field show that student activity is still less active, this is reinforced by research conducted by several studies, including Jawak et al., (2025) who stated that student learning activity is still relatively low, which is indicated by less active student involvement during learning. In another study conducted by Anggraeni & Supriyono, (2019) stated that student activity is still relatively low, which is indicated by less active student involvement during learning.

Based on observations on September 1 and 2, 2025, at a school in *Bukittinggi*, it was observed that students were required to read the Quran first, then recite a prayer, followed by the teacher's opening of the lesson. Afterward, the teacher wrote down the title of the material to be covered that day and provided an apperception. Then, during the main activity, the teacher explained the material and occasionally posed questions to students, asking if they had any questions or if there were any unclear points. There was no encouragement from the teacher to answer questions. The teacher immediately continued the lesson without prompting students to answer. Then, the teacher gave students time to take notes on the material explained. It was apparent that some students still did not take notes at all. Afterward, the teacher immediately continued the lesson as before, indicating a lack of student attention. At the end of the lesson, the teacher assigned similar exercises related to the material, which some students did not complete.

Based on observations, the learning process remained teacher-centered, with the teacher being more active than the students. During the main activity, many students appeared to lack focus, did not take notes, and tended to passively listen to the teacher's explanations. Furthermore, some students are busy talking with their deskmates or engaging in other activities, even choosing to remain silent when given the opportunity to ask questions or respond. This situation results in poor student understanding of the material, especially when given practice problems. This is exacerbated by a lack of motivation to learn and students frequently leaving class for various reasons.

Interviews with mathematics teachers at a school in *Bukittinggi* also revealed that students lack enthusiasm, tend to be passive, and easily become bored during lessons. This is reinforced by students' statements that they consider mathematics a difficult and boring subject. Therefore, solutions are needed to increase student learning engagement, one of which is through the implementation of more innovative learning models that actively involve students, such as cooperative learning.

One cooperative learning model that researchers use to increase learning engagement is the Inside-Outside-Circle (IOC) cooperative learning model, which is expected to improve student learning engagement. The Inside-Outside-Circle (IOC) cooperative learning model is a cooperative learning model that forms inner and outer circle groups, providing students with the opportunity to share information related to the subject matter simultaneously (Sukmadewi et al., 2019). The impact of the Inside-Outside-Circle (IOC) cooperative learning model is that it can create a relaxed and enjoyable classroom atmosphere, as students can actively learn with their peers. This, in turn, will foster interest in learning, which ultimately can increase student engagement in the learning process (Qodariyah, 2025).

The Inside-Outside-Circle (IOC) learning model can increase student engagement because students interact directly with various information in different pairs, alternately sharing information, creating a more dynamic and interactive learning environment than passive learning (Barus et al., 2025). This model also allows students not only to receive information but also to actively participate in explaining and conveying their understanding to others, which can also increase their confidence and skills (Nisa & Ilmi, 2025). The implementation of the Inside Outside Circle (IOC) learning model has been proven to increase student learning engagement. This is supported by relevant research from Susanti et al. (2020), which states that the Inside Outside Circle model, assisted by video media, significantly influences the mathematics learning engagement of grade V students.

The novelty of this study lies in the application of the IOC cooperative learning model in the context of junior high school mathematics learning, with a focus on student learning engagement as the variable studied. Furthermore, this study also examines learning engagement based on more comprehensive indicators, such as the ability to ask questions, answer questions, discuss, and actively participate in learning. Thus, this research provides a new contribution to the development of learning strategies oriented towards increasing student engagement.

One of the advantages of this learning model is that it can be applied to all subjects that require students to be active and understand the material. This allows them to share information with other students, thus ensuring simultaneous access to information. This method ensures total student engagement and is an excellent way to build individual responsibility in group discussions. This total student engagement will undoubtedly have a positive impact on student engagement. Based on the description above, the Inside-Outside-Circle cooperative learning model is thought to be suitable for increasing student engagement. Therefore, the author is interested in conducting a study entitled "The Effect of the Inside-Outside-Circle (IOC) Cooperative Learning Model on the Mathematics Learning Engagement of Grade VII Junior High School Students."

2. METHODS

This research is a quantitative, quasi-experimental study aimed at determining the effect of implementing a cooperative learning model on student learning engagement. The study was conducted at *SMP Negeri* 6 *Bukittinggi* among seventh-grade students in the 2025/2026 academic year. The research design used was a Nonequivalent Control Group Design, involving two classes not selected completely randomly: an experimental class and a control class. The experimental class was treated using the cooperative learning model, while the control class used conventional learning. The sample size in this study consisted of 32 students in the experimental class and 31 students in the control class. The sampling technique used purposive sampling, which selects the sample based on certain considerations, such as similar academic abilities and relatively homogeneous class characteristics based on the recommendations of subject teachers.

Data collection in this study was conducted through observation, interviews, and a student learning engagement questionnaire. Observations were used to observe student activities during the learning process using observation sheets prepared based on learning engagement indicators. Interviews were conducted with several students and teachers to obtain supporting information regarding student responses to the implemented mathematics learning. In addition, a questionnaire was used to measure the level of student learning engagement after the treatment. Data from the questionnaire and observation sheets were then processed by calculating each student's score and converting it into a percentage to determine the level of student learning engagement in both classes.

Before conducting the hypothesis testing, the data was first tested using prerequisite tests. The prerequisite tests used included normality and homogeneity tests. Normality testing was conducted using the Kolmogorov-Smirnov test to determine whether the data were normally distributed, thus meeting the requirements for using parametric statistics. Meanwhile, homogeneity testing was conducted using the Levene's test to determine whether the variances of the two sample groups were homogeneous or equal. The use of these two performance tests aims to ensure that the data analysis meets the basic assumptions of parametric statistical tests.

After the data was declared normal and homogeneous, the analysis continued with a t-test (independent sample t-test). This test was used because the study involved two different groups, the experimental class and the control class, and aimed to determine whether there was a significant difference in the average learning engagement between the two groups after the treatment. The test results were then used as the basis for drawing interesting conclusions regarding the effectiveness of the cooperative learning model in increasing student learning activity.

3. RESULTS AND DISCUSSION

To determine whether the data is normal, if sig > 0.05, the data is normal; if sig < 0.05, the data is considered abnormal. The calculation results are as follows:

Table 1. Normality Data Results

Class	L_0	L_{table}	Information
Experiment	0,14194	0,156	Normal
Control	0,140829	0,156	Normal

Source: Processed Data 2025

Based on the results of the normality test using the Liliefors test in Table 1, the value obtained ($L_0 < L_{table}$), so it can be concluded that the data for both samples are normally distributed. This finding indicates that the research data has met one of the important requirements in parametric statistical analysis, so the data is suitable for further testing. Data normality indicates that the data distribution is in a stable condition and does not experience significant deviations, so that the research results can describe the actual condition. In addition, the fulfillment of the normality assumption also indicates that the data collection process and the research instruments used have been able to produce representative data and have a good level of confidence. After it is known that the data is normally distributed, a homogeneity test is then conducted to determine the similarity of the variances of the two samples. The homogeneity test is important because it is one of the requirements in using parametric hypothesis testing. So if the data is declared homogeneous, the results of the hypothesis test can be interpreted more accurately as the effect of the treatment or the variables studied, not due to differences in characteristics between sample groups. The results of the posttest homogeneity are as follows:

Table 2. Results of Homogeneity Test

α	F_{count}	F_{table}	Keterangan
0,05	0,75173	1,804482	Homogen

Source: Processed Data 2025

Based on Table 2, the homogeneity test results show that the $F_{count} < F_{table}$ value, so it can be concluded that the sample has a homogeneous variance. The hypothesis test in this study is the t-test. The t-test used is the independent sample t-test. This test is used to determine the difference in the average of two independent data groups. The results of the hypothesis test on student learning activity in this study are as follows:

Table 3. Results of the Hypothesis Test on the Activeness of Mathematics Learning in the Sample Class Students

Class	$\bar{X}$	T	$t_{0,05;64}$	α
Experiment	130,0313	2,159	1,6741	0,05
Control	123,5	1,232	2,411	0,13

Source: Processed Data 2025

Based on Table 3, the analysis results show that at a significance level of 0.05, t = 2.159 and $t_{((0.05;62)}$ = 1.6741), meaning that $t_{count} > t_{table}$, i.e., 2.159 > 1.6741. The test criteria are: if $t_{count} > t_{table}$, then H_0 is rejected. Therefore, H_1 is accepted. It can be concluded that the mathematics learning engagement of students who follow the Inside Outside Circle (IOC) learning model is better than the learning engagement of students who follow conventional learning.

The results of the study indicate that the implementation of the Inside Outside Circle (IOC) cooperative learning model has a significant impact on students' mathematics learning engagement. This is evident from the comparison of the average learning engagement between the experimental and control classes, where the experimental class achieved an average of 130.0313, while the control class only achieved 123.5. In addition, the results of the hypothesis test show that the value ($t_{count} > t_{table}$) is 2.159 > 1.67 with a significance value < 0.05. Thus, it can be concluded that the IOC type cooperative learning model is more effective than conventional learning in increasing student learning activity.

Theoretically, these results can be explained by the characteristics of the cooperative learning model, which emphasizes social interaction and active student involvement in the learning process. The IOC model provides students with opportunities to directly engage in information exchange through paired discussions in two circles (an inner and an outer circle). This activity encourages students to not only passively receive information but also to convey, explain, and respond to the information they receive. This process aligns with constructivism theory, which states that knowledge is actively constructed by students through interactions with the environment and others.

The increase in active learning in the experimental class can also be seen from indicators of activeness such as the courage to ask questions, express opinions, and engage in discussions (Khomsatun & Winanto, 2024). In the IOC model, each student has an equal role and opportunity to participate, so no student dominates or is passive. This contrasts with conventional learning, which tends to be teacher-centered, resulting in more one-way interactions and a lack of student engagement. The findings of this study align with research conducted by Pardede et al. (2025), which stated that cooperative learning can increase student engagement because it provides space for students to construct knowledge independently through social interaction. Furthermore, Firdaus et al. (2025) also stated that the IOC model is effective in improving students' communication skills and broadening their understanding through structured information exchange.

These findings are also supported by previous research, such as that of Gulo et al. (2025), which showed that the IOC model significantly impacted students' mathematical learning outcomes and communication. Student engagement increased after implementing the IOC model, with students becoming more active in asking questions and engaging in discussions. Furthermore, research by Agustin et al. (2025) also confirmed that the IOC model is effective in increasing learning engagement across various subjects. The consistency of these research findings demonstrates the strength of the IOC model in creating interactive and participatory learning.

However, there are differences between this study and previous research. These differences lie in the research context, such as educational level, sample size, and subjects studied. This study was conducted on seventh-grade junior high school students with a relatively limited sample size, while other studies generally involve larger samples or different educational levels. Furthermore, the initial conditions of the students in this study, who were still accustomed to conventional learning, also influenced their level of adaptation to the IOC model. This suggests that the effectiveness of a learning model is influenced not only by the model itself, but also by contextual factors and student characteristics (Daulay et al., 2024).

Based on a review of previous research, limitations can be identified in research that specifically examines the effect of the IOC learning model on mathematics learning engagement at the junior high school level, particularly in a specific school context such as *SMP Negeri* 6 *Bukittinggi*. Furthermore, most previous research focuses primarily on learning outcomes, rather than on student learning engagement. Therefore, this study aims to fill this gap by focusing on learning engagement as the primary variable (Hikmah et al., 2024).

The implications of this study's results indicate that the IOC cooperative learning model can be used as an effective alternative learning strategy to increase student learning engagement, particularly in mathematics. Teachers are advised to use learning models that actively engage students more frequently, making learning more interactive, enjoyable, and meaningful. Furthermore, schools can encourage the use of innovative learning models as part of efforts to improve the quality of learning. For students, implementing the IOC model can help improve self-confidence, communication skills, and the ability to work collaboratively in groups.

However, this study has several limitations. First, the relatively small sample size means the results cannot be broadly generalized. Second, the limited timeframe for the study, which consisted of only a few meetings, means it is not possible to describe the long-term impact of the IOC model's implementation. Third, there were obstacles in implementation, such as students' unfamiliarity with active learning models and less conducive classroom conditions. Furthermore, external factors such as the learning environment and student readiness also influenced the results.

Therefore, future research is recommended to involve a larger sample size and a longer study period to obtain more comprehensive results. Furthermore, future researchers can combine the IOC model with other learning models or innovative learning media to improve learning effectiveness. Further research could also examine other aspects, such as student learning outcomes, motivation, or critical thinking skills, to obtain a more comprehensive picture of the influence of the IOC learning model.

4. CONCLUSION

Based on the results of the final questionnaire analysis of students' mathematics learning activity, the hypothesis test using the t test obtained a value of (t_{count} = 2.159) and (t_{table} = 1.6741), so that ($t_{count} > t_{table}$) at a significant level of 0.05 with (df = ($n_1 + n_{2-2}$) = 62). This shows that (H_0) is rejected and (H_1) is accepted, so it can be concluded that the learning activity of students who participate in learning with the Inside Outside Circle (IOC) model is better than students who participate in conventional learning in class VII of *SMP Negeri* 6 *Bukittinggi* in the 2025/2026 Academic Year. The application of the Inside Outside Circle (IOC) learning model is able to increase students' mathematics learning activity because during the learning process students are directly involved in activities exchanging information, discussing, asking questions, and expressing opinions with their partners or groups. Student activity can be seen in several aspects, such as increased student participation in discussions, courage to express opinions, the ability to answer and ask questions, and student involvement in solving mathematical problems. Furthermore, the IOC model provides opportunities for all students to actively interact through rotating learning pairs, encouraging typically passive students to communicate and collaborate with their peers. This creates a more engaging, interactive, and less teacher-centered learning environment. This intense interaction between students makes the mathematics learning process more meaningful, as students not only receive information but also actively construct their own understanding through the exchange of ideas and learning experiences.

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