OPEN ACCESS
Scientechno: Journal of Science and Technology
Vol. 5 No. 3. June 2026, pp. 33-49
DOI. 10.70177/ Scientechno.v5i3.3897
Research Article

INCREASING STUDENT LEARNING ACTIVITY THROUGH *JIGSAW-TYPE* COOPERATIVE LEARNING MODEL IN SCIENCE LEARNING AT MTs DARUL HIKAM

Mega Soimah[1], Feerlie Moonthana Indhra[2], and Yurnalima Dewi[3]
[1] Yasni Bungo Islamic University Jambi, Indonesia
[2]Yasni Bungo Islamic University Jambi, Indonesia
[3]Yasni Bungo Islamic University Jambi, Indonesia

Corresponding Author:

Mega Soimah,
Faculty of Teacher Training and Education, Yasni Bungo Islamic University Jambi. Jalan Lintas Sumatera Kilometer 04, Kelurahan Sungai Binjai, Kecamatan Bathin III, Kabupaten Bungo, Provinsi Jambi, Indonesia
Email: megasoimah349@gmail.com

Article Info
Received: January 30, 2026
Revised: April 28, 2026
Accepted: May 31, 2026
Online Version: June 30, 2026

Abstract
This research is motivated by the low learning activity of students in science learning at MTs Darul Hikam which is shown by the dominance of the use of conventional methods centered on teachers, so that students are less involved in asking questions, discussing, answering questions, and expressing opinions. This research aims to improve student learning activities through the application of the Jigsaw-type Cooperative Learning model in science learning. The method used is Classroom Action Research with a two-cycle design, and each cycle includes stages of planning, action implementation, observation, and reflection. The subjects of the study were 25 MT students in grade VIII C Darul Hikam, while the data were collected through observation, interviews, documentation, and questionnaires, then analyzed qualitatively and quantitatively. The results showed that student learning activity gradually increased from 38.83 percent in the first cycle of the first meeting to 54.67 percent in the second meeting, then increased again to 80.3 percent in the second cycle of the first meeting, and reached 91.83 percent in the second meeting. In conclusion, the application of the Jigsaw model is effective in increasing student learning activities in science learning. The novelty of this research lies in the focus on measuring multidimensional learning activities. Activities were measured through visual, oral, listening, writing, mental, and emotional indicators, including attention, discussion participation, listening, note-taking, thinking, and students' enthusiasm during learning. the implications suggest that the Jigsaw model is feasible to be applied as an innovative strategy to create more participatory, collaborative, and meaningful science learning

Keywords: Activeness of Learning, Classroom Action Research, *Cooperative Learning*, Jigsaw

Journal Homepage https://research.adra.ac.id/index.php/Scientechno
How to cite: Soimah, M., Indhra, F. M., & Dewi, Y. (2026). Increasing Student Learning Activity Through *Jigsaw-Type* Cooperative Learning Model in Science Learning at MTs Darul Hikam. *Scientechno: Journal of Science and Technology*, *5*(3), 33–49. https://doi.org/10.70177/Scientechno.v4i1.1420
Published by: Yayasan Adra Karima Hubbi

INTRODUCTION

Education in essence is not only oriented to the transfer of knowledge, but also to the formation of students' thinking skills, attitudes, and skills to be able to adapt to the demands of the times (Zainuri, Khadijah, Haerudin, & Sasmita, 2026). In the context of learning in schools, the success of the educational process is highly determined by the active involvement of students as learning subjects. Science learning requires students not only to memorize concepts, but to understand natural phenomena through a scientific process that involves observation, questions, discussion, and reasoning (Mutlu, 2020). However, in practice, learning still often takes place centered on the teacher, so that the space for student participation is limited. This condition has an impact on low learning activity, lack of classroom interaction, and lack of optimal achievement of learning objectives. Therefore, it is necessary to innovate a learning model that is able to place students as the main actors in the learning process.

Learning activity is an important indicator in assessing the quality of learning because it reflects students' physical, mental, emotional, and social involvement during learning activities (Lestari, Anjani, Az-zahra, Wamalia, & Faturrohman, 2025). Active students tend to understand the material more easily, dare to ask questions, be able to express opinions, and engage in collaborative problem-solving. On the other hand, learning dominated by lecture methods often gives rise to passive attitudes, easily bored, and less responsive to the material presented by the teacher (Legarde et al., 2025). In science learning, this situation becomes more problematic because science materials require high learning activities, critical thinking skills, and the ability to work together (Zulirfan, Yennita, Rahmad, & Purnama, 2021). Previous research findings show that student-centered learning is able to significantly increase learning participation. Thus, strengthening learning activity needs to be placed as the main goal in improving science learning in madrasas.

One of the learning models that is considered relevant to increase student learning activity is *Jigsaw-type* Cooperative Learning (Juhardi, Sandi, & Sahiruddin, 2025). This model organizes learners into origin groups and expert groups, so that each student has the responsibility to learn a specific piece of material and reteach it to the members of the origin group. The learning structure encourages individual involvement as well as positive dependency between students in achieving common goals. In a pedagogical perspective, Jigsaw provides a space for students to discuss, convey ideas, ask questions, and practice academic communication skills (Moin et al., 2024). In addition, this model is aligned with the characteristics of 21st-century learning that emphasize collaboration, active participation, and learning responsibility. Various studies have also shown that Jigsaw is effective in improving learning activities, motivation, and student learning outcomes in various subjects. Therefore, this model is feasible to be applied in science learning that demands intensive interaction and student involvement.

Based on the results of initial observations at MTs Darul Hikam, science learning in grade VIII still shows symptoms of low student learning activity. Some students tend to be silent during the learning process, do not respond to the teacher's questions, and have not shown optimal participation in group discussions (Leyaley, 2023). This situation is allegedly related to the dominance of the use of conventional methods that have not provided enough space for students to actively build knowledge. On the other hand, the character of science material that requires mastery of concepts and process skills has not been fully facilitated through a varied and participatory learning model (Mellyani, Wahyudi, & Suhartono, 2022). This condition shows that there is an urgent need to improve learning through a more interactive approach. In this context, the application of the Jigsaw-type *Cooperative Learning* model is seen as a strategic alternative to build a more lively, participatory, and meaningful learning atmosphere for students at MTs Darul Hikam.

A number of previous studies have proven that the application of Jigsaw has the potential to gradually increase students' learning activity through a process of cooperation,

responsibility, and positive interdependence in groups (Ramadhanti, Konjin, Wadud, Nadlir, & Wakhidah, 2025). However, most studies focus more on learning outcomes or activities at other levels and subjects, while studies that specifically place science learning in MTs are still relatively limited (Ramli, Susanti, & Yohana, 2022). In addition, the context of madrasas with distinctive characteristics of students requires more contextual empirical proof so that the learning model used is truly in accordance with the needs of the field (Muliati, Hanani, Sesmiarni, Zakir, & M, 2025). Therefore, this study is important to examine the increase of student learning activity through the Jigsaw-type *Cooperative Learning* model in science learning at MTs Darul Hikam. This research is expected to make a theoretical and practical contribution to the development of more active, collaborative, and student-oriented science learning

Studies on the Jigsaw-type *Cooperative Learning* model in science learning have been carried out extensively, but most of them still focus on improving general learning outcomes, motivation, or social skills of students at the elementary and junior high school levels at the general level (Asmara, 2020). Meanwhile, research that specifically examines student learning activity as the main focus is still relatively limited, especially in the context of tsanawiyah madrassas which have distinctive learning characteristics and classroom culture. In addition, the implementation of Jigsaw has often not been systematically directed to measure the dimensions of learning activity comprehensively, including visual, oral, listening, writing, mental, and emotional aspects (Utami, Nurhadi, & Yoto, 2023). This condition shows that there is an important research gap to be answered through contextual, measurable, and action-oriented classroom action studies that are oriented towards real changes in student learning behavior.

The novelty of this research lies in its focus of analysis which not only places the Jigsaw model as a cooperative learning strategy, but as a pedagogical tool to gradually and measurably increase student learning activity in science learning at MTs Darul Hikam. This study highlights the application of Jigsaw in a madrasah setting with female students in grade VIII C, thus providing a more specific empirical contribution to the context of science learning in the madrasah environment. In addition, this study uses more detailed indicators of learning activity to photograph changes in student participation from cycle to cycle, so that the results not only illustrate the general improvement, but also show the dynamics of learning behavior changes more accurately (Rohman, Khairi, & Devi, 2024). Thus, the novelty of this study lies in the integration between context, variable focus, and multidimensional measurement of learning activity.

This study aims to describe and analyze the increase in student learning activity through the application of the Jigsaw-type *Cooperative Learning* model in science learning at MTs Darul Hikam. In particular, this study is directed to determine changes in student activity in each learning cycle based on visual, oral, listening, writing, mental, and emotional indicators, as well as proving the effectiveness of the Jigsaw model in creating more active, participatory, and meaningful learning. The formulation of this research problem is: how the application of the Jigsaw-type *Cooperative Learning* model can increase student learning activity in science learning at MTs Darul Hikam, and the extent to which the increase in activity occurs in each action cycle. With this formulation, the research is expected to be able to provide a scientific basis for more innovative and student-centered science learning practices.

RESEARCH METHOD

This study uses a Classroom Action Research design that aims to improve the science learning process through the application of the *Jigsaw-type* Cooperative Learning model (Permatasari, 2023). This design was chosen because it is in line with the research focus, which is to increase student learning activity directly in the classroom through planned, systematic, and reflective actions. The subject of the study was 25 students in grade VIII C MTs Darul

Hikam and showed a low learning activity in science learning. The research is carried out collaboratively between researchers and subject teachers to ensure that actions are in accordance with the needs of the class. The research procedure follows the Kemmis and McTaggart model which includes the stages of planning, implementation of actions, observation, and reflection (Santosa, 2023). Each cycle is designed to see changes in student learning activity after the application of Jigsaw, as well as to be the basis for learning improvement in the next cycle so that the results obtained are more optimal and contextual.

The research instruments used include student learning activity observation sheets, student response questionnaires, interview guidelines, and learning documentation (Anggraini & Junaidi, 2024). The observation sheets are compiled based on indicators of learning activity, namely visual, oral, listening, writing, mental, and emotional aspects, so that changes in student behavior can be observed more comprehensively. The questionnaire was used to obtain data on students' perceptions of their involvement in learning with the Jigsaw model (Ismi, Witasoka, & Junari, 2025). Interviews were conducted with teachers and some students to dig up preliminary information about learning conditions, obstacles faced, and responses to given actions. Documentation is used to complete the data in the form of photos of activities, learning tools, and field notes. Data collection techniques are carried out through direct observation during learning, filling out questionnaires after actions, interviews before and after the cycle, and collecting supporting documents. All instruments are designed to be able to describe the conditions of student learning activity accurately, objectively, and academically accountable.

Data analysis techniques are carried out qualitatively and quantitatively. Qualitative analysis is used to describe the learning process, student responses, and changes in learning behavior at each stage of action (Apriliyani & Nugroho, 2025). This analysis is carried out through data reduction, data presentation, and drawing conclusions based on the results of observation, interviews, and documentation. Meanwhile, quantitative analysis was used to calculate the percentage of student learning activity from the results of observation sheets and questionnaires. The percentage is then classified into the categories of very active, active, moderately active, less active, and inactive to find out the level of achievement of each cycle (Rismadani, Fuadiah, & Masnunah, 2026). The results of the inter-meeting and inter-cycle analysis were systematically compared to see the effectiveness of the application of the Jigsaw model in increasing student learning activity. Thus, the data analysis technique in this study not only describes the numerical improvement, but also explains the dynamics of changes in student learning activities in a comprehensive and meaningful way.

Data from observation results are analyzed quantitatively using percentages, student activeness in learning.

Table 1. Benchmark Reference Assessment Criteria

$$\text{Persentase} = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100$$

Score/Value Interval	Category
81-100%	Highly Active
61-80%	Active
41-60%	Quite Active
21-40%	Less Active
0-20%	Inactive

RESULTS AND DISCUSSION

Student learning activity is a condition of students' physical, mental, social, and emotional involvement in the learning process that allows for meaningful learning experiences (Belajar et al., 2023). In science learning, activeness is an important element because the material requires students to observe, ask, discuss, reason, and conclude phenomena

scientifically. Active learning is not only seen from students' courage in answering the teacher's questions, but also from their participation in group work, the ability to express opinions, and their seriousness in completing learning tasks (Rohman et al., 2024). Active students tend to understand concepts more easily because they build knowledge through direct interaction with learning resources and peers. Therefore, active learning needs to be seen as an indicator of learning quality that is closely related to the success of achieving educational goals, especially in science learning in madrasas which requires integration between knowledge, attitudes, and process skills.

The Jigsaw-type Cooperative Learning *model* is one of the cooperative learning approaches that places students at the center of learning activities through cooperation in the origin group and the expert group (Dat et al., 2021). In this model, each student learns a specific piece of material, then is responsible for explaining that part to the rest of the group, thus creating positive interdependence and individual responsibility. Theoretically, Jigsaw supports the principle of active learning because it encourages students to read, understand, discuss, convey ideas, listen to friends' opinions, and present learning results collaboratively (Anisa & Hidayah, 2024). This character is very suitable for science learning which requires an exploratory and communicative process. In addition, Jigsaw is also relevant to be used to increase student confidence, sense of responsibility, and participation in the classroom. Thus, the application of this model is conceptually believed to be able to strengthen student learning activity and become a strong theoretical basis for research on improving science learning at MTs Darul Hikam.

In cycle I, the application of the Jigsaw-type *Cooperative Learning* model has not shown optimal results, although it is starting to show changes in a better direction than the initial learning conditions (Soedimardjono & P, 2021);(Wahyono, Rasul, & Wadaron, 2022). The results of observations at the first meeting showed that the level of student learning activity was still in the less active category with a percentage of 39.83 percent. This condition can be seen from the low participation of students in paying attention to explanations, asking questions, answering questions, and expressing opinions during group discussions. However, at the second meeting of the first cycle, there was an increase to 54.67 percent with the category of being quite active. This increase shows that students are beginning to adapt to cooperative learning patterns and role sharing in Jigsaw groups. However, some students still appear passive, lack confidence, and have not participated evenly, so reflection and improvement of actions in the next cycle are needed to achieve the indicators of research success.

In cycle II, the results showed a more significant increase in learning activity after improvements in actions based on reflection in the previous cycle. In the first meeting of cycle II, the percentage of student learning activity reached 80.3 percent with the active category. These achievements show that most students have begun to engage more intensively in visual, oral, listening, writing, mental, and emotional activities during science learning (Nilawati, 2021). Students seemed more courageous to ask questions, express opinions, discuss with group members, and convey the results of the discussion in a more structured manner. Furthermore, at the second meeting of cycle II, the percentage of activity increased to 91.83 percent with the very active category. These results confirm that the application of the Jigsaw model is able to create a more participatory, collaborative, and student-centered learning atmosphere, so that the goal of classroom action to increase learning activity can be optimally achieved.

Overall, the results of the study prove that the application of the Jigsaw-type *Cooperative Learning* model is effective in increasing student learning activity in science learning in grade VIII C MTs Darul Hikam. The increase appears to be gradual from cycle I to cycle II and occurs in all observed indicators of learning activity, namely visual, oral, listening, writing, mental, and emotional. These findings are in line with a theoretical framework that positions Jigsaw as a cooperative learning model that encourages individual responsibility,

interaction between students, and active involvement in the learning process. With the structure of the origin group and the expert group, students not only become recipients of information, but also act as presenters and explainers of material for peers. Therefore, the results of this study show that the use of the Jigsaw model in science learning can be an effective pedagogical strategy to overcome the low learning activity of students in madrasas.

Table 2. Recapitulation of Student Learning Activity Results

Siklus	Meetings	Total Score	Percentage	Category
I	1	478	39,83%	Less Active
I	2	656	54,67%	Quite Active
II	1	964	80,30%	Active
II	2	1.102	91,83%	Highly Active

Based on the table, it can be seen that there is an increase in student learning activity from cycle I to cycle II. In the first cycle of the first meeting, the students' activity was still in the less active category, then increased to quite active at the second meeting. In cycle II, student activity increased higher, namely being active at the first meeting and very active at the second meeting. This data shows that the application of *the Jigsaw-type Cooperative Learning* model has succeeded in increasing student learning activity in science learning at MTs Darul Hikam.

The application of the Jigsaw-type *Cooperative Learning* model in science learning at MTs Darul Hikam is carried out as a form of learning innovation that is oriented towards student activity. This model was chosen because it is able to shift learning from a teacher-centered pattern to a student-centered pattern (Irmanto, 2023). In practice, teachers are no longer the only source of information, but rather act as facilitators who direct the learning process through task sharing, group discussions, and presentation of results. In science learning, this approach is very relevant because science material requires students to understand concepts, explain phenomena, and actively interact with peers. Through Jigsaw, students are encouraged to be directly involved in the learning process so that the classroom atmosphere becomes more lively, communicative, and collaborative. Thus, the application of this model is not just a variation of methods, but a pedagogical strategy to improve the quality of student learning participation (Moin et al., 2024).

Theoretically, the Jigsaw model works through cooperative learning that places each student as an essential part of the group's success (Hasanah, Chasanah, Talib, & Zumirddat, 2025). In this structure, students are divided into origin groups, then transferred to expert groups to study specific parts of the material in depth. After understanding the material, students return to the original group to teach the section to the other members. This mechanism requires individual responsibility as well as cooperation between students. In the context of science learning, this structure is very effective because it encourages students to read, discuss, listen, process information, and re-explain concepts orally (Moin et al., 2024). These activities are in line with the principle of active learning that emphasizes the mental and social involvement of students. Therefore, the application of Jigsaw in this study has a strong theoretical basis to encourage a more meaningful and participatory learning process.

The implementation of actions in this study begins with a planning stage that is systematically arranged so that learning runs effectively (Santosa, 2023). Teachers and researchers prepare learning tools, teaching modules, activity observation sheets, and questionnaire instruments to monitor student progress during the action. At this stage, the science material is also sorted into several appropriate sections to be distributed to the expert group. The division of material is important because it determines the success of the interaction in the Jigsaw group (Rembang & Rembang, 2021). In addition, teachers arrange the composition of the group in a heterogeneous manner so that students with different abilities can help each other. Careful planning allows the learning process to take place in a directional manner and not only focus on the delivery of material, but also on student learning activities.

Thus, the application of Jigsaw in science learning is not carried out spontaneously, but through a structured learning design and in accordance with the goal of increasing learning activity.

In the implementation stage, students are first directed to understand the workflow of the Jigsaw model so that they know their respective roles in learning. The teacher explains the learning objectives, forms the original group, then provides sub-material to each group member. After that, students gather with friends who hold similar submaterial in an expert group to discuss the content of the material in more depth (Anjani, 2025). This process provides students with the opportunity to exchange knowledge, clarify understanding, and strengthen mastery of concepts before returning to the home group. In the home group, each student is responsible for explaining the results of his or her discussion to the other members. This stage is at the heart of the Jigsaw model because it demands courage, communication, and a sense of responsibility. In science learning, this process makes students not only accept the teacher's explanations, but also actively build common knowledge (Chopra et al., 2023). Thus, the implementation of Jigsaw creates more interactive and meaningful learning activities.

The observation stage showed that the application of Jigsaw was able to change the pattern of student activity gradually. At the beginning of the implementation, some students still seemed hesitant to speak, ask questions, or express opinions (Suwartono & Romdona, 2024). This is natural because students are still adjusting to learning models that demand active participation. However, after being given repeated opportunities to discuss and present results, students begin to show better engagement. They are more focused when receiving material, interact more often with their group mates, and are more confident when delivering the results of the discussion. This condition is in line with the results of research that show an increase from the inactive category in the initial cycle to active and very active in the next cycle (Abdillah, Saihan, Muhith, & Rahman, 2024). In other words, the application of Jigsaw not only improves the learning process, but also builds a learning culture that encourages students to engage directly and responsibly in the learning process.

The success of the implementation of the Jigsaw model can also be seen from the increase in the quality of interaction between students in the science learning process. Group discussions make students learn to respect the opinions of their peers, work together in completing assignments, and complement each other's understanding of the material. In conventional learning, students tend to be passive and depend on the teacher's explanations, while in Jigsaw they are required to actively contribute knowledge (Baidoo et al., 2025). This situation fosters confidence as well as social responsibility in learning. In addition, the existence of an expert group provides space for students to explore certain material more intensively before explaining to the group of origin. These activities strengthen conceptual understanding because students not only read, but also process and reconvey information (Gillies, 2023). Therefore, the application of Jigsaw in science learning at MTs Darul Hikam can be seen as an effective strategy to build students' intellectual and social activity simultaneously.

Overall, the application of the Jigsaw-type *Cooperative Learning* model to science learning at MTs Darul Hikam is in accordance with the principles of cooperative learning which emphasizes active participation, individual responsibility, and positive interdependence. The results of the action showed that students were increasingly active in observing, discussing, questioning, answering, writing, and presenting material. This process proves that Jigsaw is not only effective as a learning model, but also relevant to overcome the low learning activity of students in science subjects. This success is supported by good planning, structured implementation, and continuous reflection on each cycle. Thus, the application of the Jigsaw model can be understood as a pedagogical effort that is able to create more participatory, communicative, and meaningful science learning. These findings also strengthen the argument

that the cooperative learning model is feasible to be used in the context of madrasas to improve the quality of student learning engagement

Before the implementation of the *Jigsaw-type Cooperative Learning* model , student learning activity in science learning in grade VIII C MTs Darul Hikam was at a low level and did not meet the expectations of student-centered learning. This initial condition can be seen from the learning process which is still dominated by conventional methods with a *teacher-centered* pattern, so that students receive more explanations than are actively involved in building understanding (Hsiao, Chen, Chen, & Lin, 2021). In this situation, learning activities that should appear in science learning, such as asking, responding, discussing, recording important findings, and concluding material, have not been optimally seen. Based on initial observations, classes tend to be passive and learning interactions take place one-way. This situation shows that the space for student participation is still limited, so that learning activity has not developed as a consistent academic behavior. Thus, the conditions before action show the existence of a fundamental problem that demands a more participatory, collaborative, and structured pedagogical intervention.

The low level of student learning activity before action is also confirmed through the results of interviews with teachers and students who show some of the main problems in science learning (Felianti & Sanoto, 2023). These problems include low student responses to teacher questions, the tendency of students to get bored easily during lessons, the lack of implementation of innovative learning models, and the lack of optimal student understanding of the material presented. Of the 25 students, only about 40 percent showed activeness in learning activities, while most of the others were still passive during learning. This percentage confirms that learning participation is not even and has not yet become a class character. Within the framework of the theory of learning activeness, the findings show the weak visual, oral, mental, and emotional involvement of students (Ariffani, 2025). Therefore, this initial condition not only illustrates the low level of student activity, but also reflects the need to improve learning strategies so that the science learning process becomes more lively and meaningful.

If analyzed based on the indicators of learning activity, conditions before the implementation of Jigsaw show that almost all dimensions of activity have not developed optimally. In the visual aspect, students' attention to the teacher's explanation has not been stable because some students are still easily distracted during learning (Dianah, 2018). In the oral aspect, students' courage to ask questions, answer questions, and express opinions is still relatively low, so verbal interaction in the classroom takes place in a limited way (Anjuana, 2021). In the aspect of listening, not all students showed seriousness in listening to explanations and responses from friends. In the aspect of writing, student involvement in recording important learning points is also uneven (Abdul, 2021). Meanwhile, the mental and emotional aspects are still weak, as seen from low enthusiasm, lack of confidence, and lack of initiative in completing tasks. These findings show that prior to action, science learning had not encouraged students' full physical, intellectual, and social engagement.

These initial conditions are closely related to the character of learning that is still teacher-centered, so that students do not have enough opportunities to interact, explore ideas, and learn collaboratively. In science learning, situations like this become obstacles because the nature of science requires not only mastery of concepts, but also active involvement in scientific processes, such as observing, communicating findings, reasoning, and discussing problems (Judijanto et al., 2025). When the learning strategy does not provide space for students to experience the process, it is difficult to grow actively. Pedagogically, this shows that the low activity of students is not solely caused by individual factors, but also by learning approaches that do not yet support participation (Ristiani, Ali, & Apriyanto, 2025) Thus, the conditions before the action show a discrepancy between the demands of science learning and the learning

practices that take place in the classroom. This situation then became the rational basis for the application of the Jigsaw model in this study.

Initial data from classroom action research further clarifies the picture that students' learning activity before action is indeed in the low category. This can be seen in the observation results of the first meeting of the first cycle which recorded an active percentage of 38.83 percent with the less active category. This achievement reflects the initial condition of learning which is characterized by low student participation in paying attention to explanations, answering questions, expressing opinions, giving responses, and working together in group discussions. In fact, several indicators such as active listening and mental activity are still in the category of less active (Nazihah, 2026) In the context of research data analysis, this number serves as a starting point for assessing the changes that occur after an action is taken. Therefore, the low initial condition is not just a statistical number, but empirical evidence that science learning before the implementation of Jigsaw has not been able to foster student learning involvement optimally, systematically, and evenly in the classroom.

When associated with the theoretical framework, low activity before action indicates that students have not gained learning experiences that allow them to become full learning subjects (Wahyuningsih, 2020) The theory of learning activeness places students as individuals who must be involved physically, mentally, emotionally, and socially to achieve meaningful learning outcomes. However, in the initial conditions in grade VIII C, science learning has not provided enough space for students to build knowledge through interaction with peers and teachers. These limitations have an impact on students' weak courage to express opinions, lack of responsibility for learning, and low ability to participate in discussions. In addition, the lack of a cooperative learning atmosphere causes some students to only become passive listeners. Thus, the answer to the formulation of the second problem confirms that the initial condition of student activity is still far from the characteristics of active learning expected in science subjects.

In the context of madrasas, the low condition of learning activity before action also indicates that learning has not fully supported the formation of responsible and participatory learning attitudes. In fact, science learning in madrassas is not only directed at mastering the material, but also at developing learning characters such as discipline, cooperation, courage to speak up, and seriousness in following the learning process (Hutasuhut, 2024) Before the Jigsaw model was implemented, these values were not yet strongly visible in student learning behavior. The classroom still shows the dominance of the teacher, while the students have not been encouraged to take an active role in understanding and delivering the material. From the perspective of classroom action research, this condition is very important to map because it is the basis for the preparation of corrective actions in the next cycle (Farih Azizah & Mustar, 2025) Therefore, the initial state of low learning activity not only illustrates learning problems, but also becomes a strategic foundation for more effective learning changes.

Overall, student learning activity in science learning before the implementation of the Jigsaw-type *Cooperative Learning model* at MTs Darul Hikam is in the low category and not in accordance with the demands of active learning. The low condition is reflected in the lack of student participation, limited class interaction, low response to teacher questions, and lack of optimal student involvement in visual, oral, listening, writing, mental, and emotional aspects. The findings of initial observations, interviews, and preliminary measurement results at the first meeting of the first cycle consistently show that the learning that takes place still tends to be passive. Thus, the formulation of the second problem can be answered that before action is taken, students' learning activity is still low and requires intervention in a more innovative and collaborative learning model. This initial condition then became the empirical and argumentative basis for the application of the Jigsaw model as a strategy to increase student learning activity in science learning at MTs Darul Hikam.

The increase in student learning activity after the application of the *Jigsaw-type Cooperative Learning* model appears to be gradual and consistent in each research cycle (Ruspandi, 2021) At the beginning of the action, student activity was still in the less active category with a percentage of 38.83 percent at the first meeting of the first cycle. This increase shows that changes in learning strategies are starting to affect student involvement in science learning. In cycle II, the results of the increase became more pronounced, namely 80.3 percent at the first meeting with the active category, then reached 91.83 percent at the second meeting with the very active category. This data proves that the Jigsaw model is effective in gradually increasing student participation through a systematically designed action process.

The increase is not only seen in the percentage figure, but also in the change in the quality of student learning behavior during the learning process. In the first cycle, some students still seemed hesitant to express their opinions, lacked confidence when explaining the material to friends, and were not fully active in group discussions. However, after reflection and action improvement in cycle II, students' learning behavior underwent significant changes. Students begin to dare to ask questions, give responses, convey the results of discussions, and show stronger involvement in completing group assignments. In the perspective of the theory of active learning, these changes indicate the development of physical, mental, social, and emotional participation in a more balanced manner (Hapsari & Murniawaty, 2025) Thus, the application of the Jigsaw model not only increases the activeness score quantitatively, but also improves the quality of students' learning experience in science learning in real time.

When viewed based on indicators of active learning, the improvement after the application of Jigsaw occurred in all aspects observed, namely visual, oral, listening, writing, mental, and emotional (Koda, 2024) In the first cycle of the first meeting, several indicators such as listening activity and mental activity were still in the less active category, while other indicators had only reached quite active. After the action was corrected, all indicators at the second meeting of cycle I were upgraded to the fairly active category. A stronger improvement was seen in cycle II, when visual and verbal indicators reached the active category, while the listening, mental, and emotional indicators began to enter the very active category. At the last meeting, all indicators were in the very active category. These findings suggest that the Jigsaw model has an all-around impact on student engagement. Therefore, the increase in activeness is not partial, but covers all dimensions of learning behavior that are the focus of the research.

In the context of classroom action research methods, the increase in student learning activity after the application of Jigsaw does not occur instantly, but through stages of planning, action, observation, and reflection that take place repeatedly (Pandiangan, 2020) Each cycle is used to identify previous learning weaknesses, then develop corrective actions to make the learning process more effective. In cycle I, teachers and researchers found that some students still needed assistance to understand their role in the group. Based on this reflection, improvements were made in the second cycle through more targeted explanations, more effective group management, and strengthening of students' learning motivation. As a result, learning activity increased significantly. These findings confirm that the success of the Jigsaw model is determined not only by the design of the model itself, but also by the quality of the execution of the action that is adaptive to the conditions of the class. Thus, increased activeness is the result of a reflective and planned pedagogical process.

Theoretically, the increase in student learning activity after the application of Jigsaw can be explained through the basic principles of cooperative learning that emphasize individual responsibility, positive interdependence, and interaction between students (Rahmi, Ma'wa, & Alim, 2024) In this model, each student has the role of mastering a particular piece of material in the expert group, then relaying it back to the home group. This mechanism makes students unable to be passive because the success of the group depends on the contribution of each member. In science learning, this structure is very relevant because it encourages students to read, understand concepts, discuss information, and convey learning results orally. These

activities directly contribute to increasing student activity on various indicators (Ristiani et al., 2025) Therefore, the increase that occurred in this study is in line with the theory that Jigsaw-type cooperative learning is able to create an active, collaborative, and student-centered learning environment.

The increase in student learning activity also shows that the Jigsaw model has succeeded in overcoming a number of initial problems found in science learning at MTs Darul Hikam. Before action, students are easily bored, do not respond to the teacher's questions, and are not optimally involved in the learning process (Dardiri, 2024) Once the Jigsaw model was implemented, the classroom atmosphere turned into a more lively one because students had the responsibility to learn as well as teach the material to friends. This responsibility gives rise to a stronger intrinsic motivation, as students feel their role is important in the success of the group. In addition, cooperation in expert groups and home groups provides a more meaningful learning experience than one-way learning patterns. Thus, the increase in activeness that occurs is not only a technical result of changing methods, but is a consequence of creating a more participatory, communicative, and supportive learning environment for students.

Overall, the answer to the formulation of the third problem shows that the application of the *Jigsaw-type Cooperative Learning model* has succeeded in significantly increasing student learning activity in science learning at MTs Darul Higam. The increase can be seen from the change in the category of learning activity from less active at the beginning of the action, to moderately active, active, to very active at the end of the study. In addition to being shown by the increase in percentage from 38.83 percent to 91.83 percent, the increase was also seen in changes in the learning behavior of students who were more courageous, enthusiastic, communicative, and responsible in learning activities. These findings prove that the Jigsaw model is relevant to be used as a pedagogical strategy to increase student engagement in science learning. Thus, the results of the study strengthen the argument that Jigsaw-type cooperative learning is not only effective theoretically, but also empirically proven to increase student learning activity in the context of tsanawiyah madrasah.

Siklus	Meetings	Activeness Percentage	Category
I	1	38,83%	Less Active
I	2	54,67%	Quite Active
II	1	80,3%	Active
II	2	91,83%	Highly Active

This table shows the pattern of increasing student learning activity that takes place gradually from cycle I to cycle II after the application of *the Jigsaw-type Cooperative Learning* model to science learning.

Analytically, the increase in student learning activity cannot be understood solely as an increase in percentage, but as an indicator of changes in the structure of pedagogical interaction in the classroom. Before action, science learning takes place in a one-way transmission pattern that places the teacher as the center of knowledge, so students tend to be passive and only respond minimally (Menninga, Geert, Vondel, Steenbeek, & Dijk, 2021) Once the Jigsaw model was implemented, the classroom structure changed to a cooperative learning space that demanded that each student hold a specific academic role through an origin group and an expert group. This change is important because activeness of learning essentially grows when students have the responsibility, the opportunity to speak, and the need to contribute to the group's success. Thus, the increase from the least active category to the very active category shows that the Jigsaw model works not only at the technical level of learning, but at the level of transformation of learning relationships that were previously passive to participatory, dialogical, and meaningful.

From a theoretical perspective, the findings of this study reinforce the assumption that active learning is the result of a learning design that is able to integrate cognitive, social, and emotional engagement simultaneously. The Jigsaw model is effective because it conditions

students to not only receive information, but also process, explain, listen, and negotiate understanding with peers. In the context of science learning, this mechanism is very relevant because science material requires thinking activities, scientific communication, and cooperation in understanding concepts (Kebede, Zema, Geletu, & Zinabu, 2025) When students are given the responsibility of being carriers of material in groups, they are encouraged to read more carefully, speak more confidently, and listen more seriously. This explains why the increase in activeness occurs in all indicators, ranging from visual, verbal, listening, writing, mental, to emotional. In other words, the effectiveness of Jigsaw lies in its ability to activate the entire learning dimension of students in an integrated manner.

Methodologically and practically, the results of this study also show that the success of increasing activeness does not solely come from the selection of learning models, but from the consistency of implementing a reflective action cycle (Gaul & Ginting, 2025) In cycle I, the improvement that has not been optimal shows that students' adaptation to the new model requires time, mentoring, and strengthening the role of teachers as facilitators. The reflection carried out then allowed the researcher to improve the implementation strategy in cycle II, so that the quality of group interaction became more effective and student activity increased significantly. These findings confirm that in classroom action research, successful learning change is always born from a combination of the right model, adaptive classroom management, and continuous evaluation. Therefore, the main contribution of this study lies not only in the evidence that Jigsaw is effective in increasing learning activity, but also in the affirmation that pedagogical innovation should be carried out in a planned, reflective, and contextual manner according to the needs of the classroom.

CONCLUSION

Based on the results of the classroom action research carried out in two cycles, it can be concluded that the application *of the Jigsaw-type Cooperative Learning* model to science learning in class VIII C MTs Darul Hikam has proven to be effective in increasing student learning activity. Before the action was taken, learning conditions were still dominated by conventional approaches centered on teachers, so that student activity was at a low level and learning participation had not developed optimally. After the Jigsaw model was applied, there was a real change in the learning process, namely students became more active in paying attention to explanations, asking questions, answering questions, discussing, writing, and expressing opinions. The increase was seen gradually from 38.83 percent in the first cycle of the first meeting with the less active category, to 54.67 percent in the second meeting with the moderately active category, then increased to 80.3 percent in the second cycle of the first meeting with the active category, and reached 91.83 percent in the second meeting with the very active category. These findings show that the Jigsaw model is able to create participatory, collaborative, and meaningful science learning, and is feasible to be used as an innovative strategy to increase student learning activity in madrasas.

ACKNOWLEDGMENTS

Thank you to all parties who have provided support, guidance, and contributions in the preparation of this article. Thank you to the supervisor who has taken the time, energy, and thought to provide direction, input, and correction so that this article can be better compiled. Gratitude was also addressed to the head of the madrasah, science teachers, and all MTs Darul Hikam students who have helped the smooth implementation of the research. Not forgetting the appreciation given to family and colleagues for their prayers, enthusiasm, and moral support that always strengthened during the writing process. May all goodness become charity and get a double reward.

REFERENCES

Abdillah, Z., Saihan, S., Muhith, A., & Rahman, Y. (2024). Implementation of the Jigsaw Type Cooperative Learning Method in Increasing Student Learning Activity in Islamic Cultural History Subjects. *Fikrotuna: Jurnal Pendidikan Dan Manajemen Islam*. https://doi.org/10.32806/jf.v14i2.620

Abdul, W. (2021). Analisis Model Pembelajaran Active Learning Tipe Jigsaw terhadap keaktifan belajar siswa kelas IV SDN 3 Margadadi. UIN Raden Intan Lampung.

Anggraini, M. S., & Junaidi, J. (2024). Penerapan Model Pembelajaran Take and Give Untuk Meningkatkan Keaktifan Belajar Sosiologi Siswa di SMAN 1 2x11 Kayutanam Padang Pariaman. *Naradidik: Journal of Education and Pedagogy*. Retrieved from https://api.semanticscholar.org/CorpusID:268758837

Anisa, L., & Hidayah, I. N. (2024). Application of the Jigsaw cooperative learning model with Edmodo to improve students' active learning in the Pythagorean theorem. In *The 3rd International Conference On Mathematics And Its Applications (Icomathapp) 2022: The Latest Trends and Opportunities of Research on Mathematics and Mathematics Education*. https://doi.org/10.1063/5.0195461

Anjani, C. K. (2025). Jigsaw Type Cooperative Learning Assisted by Genially Media to Improve the Students Activity and Learning Outcomes of IPAS. *Jurnal Penelitian Pendidikan IPA*. https://doi.org/10.29303/jppipa.v11i3.10409

Anjuana, T. P. (2021). Upaya meningkatkan keaktifan siswa dalam pembelajaran akidah akhlak melalui cooperative learning tipe jigsaw di kelas VIII 2 MTsN 3 Tapanuli Selatan Lokasi Panobasan. IAIN Padangsidimpuan.

Apriliyani, K., & Nugroho, A. S. (2025). Penerapan Model Kooperatif Tipe NHT Berbantuan Augmented Reality untuk Meningkatkan Minat dan Motivasi Belajar Siswa. *JGK (Jurnal Guru Kita)*. Retrieved from https://api.semanticscholar.org/CorpusID:282732621

Ariffani, K. (2025). Pengaruh kecerdasan emosional dan efikasi diri terhadap tingkat partisipasi aktif siswa dalam diskusi kelas pada mata pelajaran IPS di MTsN Kota Batu. Universitas Islam Negeri Maulana Malik Ibrahim.

Asmara, D. (2020). Penerapan Model Pembelajaran Kooperatif Tipe Jigsaw untuk Meningkatkan Hasil Belajar IPA Siswa. *Journal of Education and Instruction (JOEAI)*. https://doi.org/10.31539/joeai.v3i1.1286

Bahwa, M., Nasional, P., berfungsi mengembangkan, kemampuan dan membentuk, watak serta, peradaban bangsa, … langkah-langkah, U. (2021). Implementasi Model Cooperative Learning Tipe Jigsaw untuk Meningkatkan Prestasi Belajar Siswa. *Inovasi Kurikulum*. Retrieved from https://api.semanticscholar.org/CorpusID:246592202

Baidoo, J., Mutesasira, G., Makena, B., Kasumba, H., Masha, A., Kumanda, N., & Mashologu, M. (2025). In-Service Mathematics teachers' experiences with the Jigsaw method for teaching fractions: A case study in South African intermediate phase classrooms. *Multidisciplinary Science Journal*. https://doi.org/10.31893/multiscience.2026190

Belajar, M. H., di Madrasah, S., Baharun, H., Agama, I., Jadid, I. N., Probolinggo, P., … Wal, L. (2023). Penerapan Pembelajaran Active Learning Untuk Meningkatkan Hasil Belajar Siswa Di Madrasah. *Journal of Student Research*. Retrieved from https://api.semanticscholar.org/CorpusID:256654534

Chopra, D., Kwatra, G., Bhandari, B., Sidhu, J., Rai, J., & Tripathi, C. (2023). Jigsaw Classroom: Perceptions of Students and Teachers. *Medical Science Educator*, *33*, 853–859. https://doi.org/10.1007/s40670-023-01805-z

Dardiri, D. H. (2024). Pendekatan cooperative learning terhadap peningkatan keaktifan belajar siswa pada mata pelajaran IPS Kelas VII MTs Bahrul Maghfiroh. Universitas Islam Negeri Maulana Malik Ibrahim.

Dianah, A. F. (2018). Penerapan Model Pembelajaran Jigsaw Untuk Meningkatkan Keaktifan Belajar Siswa. *Jurnal Penelitian Pendidikan*, *17*(3), 249–262.

Farih Azizah, D., & Mustar, S. (2025). Perbandingan Hasil Belajar Siswa antara Metode Jigsaw dan Metode Konvensional terhadap Berpikir Kritis Siswa Kelas VIII dalam Pembelajaran Pendidikan Agama Islam di Smp N 02 Rl. Institut Agama Islam Negeri (IAIN) Curup.

Felianti, E. S., & Sanoto, H. (2023). Penerapan Model Problem Based Learning dalam Meningkatkan Keaktifan dan Hasil Belajar Siswa pada Mata Pelajaran IPA SD. *JIIP-Jurnal Ilmiah Ilmu Pendidikan*, *6*(9), 7404–7413.

Gaul, M., & Ginting, E. B. (2025). Classroom Action Research: Implementation of the Student Teams Achievement Divisions Type Cooperative Learning Model to Improvee Student Discipline. *Jurnal Penelitian Pendidikan IPA*. https://doi.org/10.29303/jppipa.v11i9.12284

Gillies, R. (2023). Using Cooperative Learning to Enhance Students' Learning and Engagement during Inquiry-Based Science. *Education Sciences*. https://doi.org/10.3390/educsci13121242

Hapsari, D. M. A., & Murniawaty, I. (2025). Model Pembelajaran Kooperatif Tipe Rotating Trio Exchange Untuk Meningkatkan Keaktifan Belajar Ekonomi: Tinjauan Studi Literatur. *Bookchapter Ekonomi Universitas Negeri Semarang*, *3*, 18–34.

Hasanah, U., Chasanah, U., Talib, U. S., & Zumirddat, W. O. (2025). Jigsaw Type Cooperative Learning Model to Improve Students' Cooperation and Tolerance Character at MI Siti Fatimah Tawangrejeni Turen. *DEEP LEARNING: Journal of Educational Research*. https://doi.org/10.62945/deeplearning.v1i1.204

Hsiao, J., Chen, S.-K., Chen, W., & Lin, S. (2021). Developing a plugged-in class observation protocol in high-school blended STEM classes: Student engagement, teacher behaviors and student-teacher interaction patterns. *Comput. Educ.*, *178*, 104403. https://doi.org/10.1016/j.compedu.2021.104403

Hutasuhut, E. F. (2024). Upaya meningkatkan keaktifan belajar peserta didik dengan menerapkan model pembelajaran team games tournament pada mata pelajaran IPA di Kelas V SDN 101570 Hotang Sasa. UIN Syekh Ali Hasan Ahmad Addary Padangsidimpuan.

Irmanto, I. (2023). Improving Physics Learning Outcomes Through the jigsaw Cooperative Learning Model in Class X IPA-1 Students of SMA Negeri 6 Batang Hari. *Asian Journal of Engineering, Social and Health*. https://doi.org/10.46799/ajesh.v2i9.121

Ismi, R., Witasoka, D., & Junari. (2025). Pengaruh Multisensori terhadap Hasil Belajar dan Keterlibatan Siswa dalam Pembelajaran Inklusif. *Pendiri: Jurnal Riset Pendidikan*. Retrieved from https://api.semanticscholar.org/CorpusID:280342284

Judijanto, L., Abdullah, G., Asshagab, S. M., Darwis, R., Setyaningrum, S., Wiliyanti, V., … Rahmawaty, R. (2025). *Pembelajaran IPA: Teori dan Praktik*. PT. Sonpedia Publishing Indonesia.

Juhardi, Sandi, & Sahiruddin. (2025). Pengaruh Penerapan Model Pembelajaran Cooperative Learning Tipe Stad (Student Team Achievement Devisions) Terhadap Hasil Belajar Siswa. *Jurnal Pengabdian Masyarakat Dan Riset Pendidikan*. Retrieved from https://api.semanticscholar.org/CorpusID:280531794

Kebede, Y. A., Zema, F. K., Geletu, G., & Zinabu, S. (2025). Cooperative Learning Instructional Approach and Student's Biology Achievement: A Quasi-Experimental Evaluation of Jigsaw Cooperative Learning Model in Secondary Schools in Gedeo Zone, South Ethiopia. *SAGE Open*, *15*. https://doi.org/10.1177/21582440251318883

Koda, M. (2024). Pengaruh Penggunaan Model Pembelajaran Kooperatif Jigsaw dengan Pendekatan Contextual Teaching Learning untuk Meningkatkan Keaktifan Siswa pada Pembelajaran Biologi. *Bioed: Jurnal Pendidikan Biologi*, *12*(2), 135–143.

Legarde, M. A., Del Mundo, M., Chavez, J., Jailani, A. B., Calzada, K. Dela, Quisay, A. R., & Piñero-Abdurajak, K. (2025). Empowering learning engagement in higher education with active learning experiences in STEM classrooms. *Environment and Social Psychology*. https://doi.org/10.59429/esp.v10i9.3878

Lestari, A. T., Anjani, D., Az-zahra, M. A., Wamalia, W., & Faturrohman, L. (2025). Kenyamanan Lingkungan Sekolah sebagai Faktor Pembentukan Ritme Belajar yang Lebih Seimbang. *RIGGS: Journal of Artificial Intelligence and Digital Business*. Retrieved from https://api.semanticscholar.org/CorpusID:284289673

Leyaley, R. (2023). Students' Passiveness in Speaking English: The Culprit behind the Silence in the Classroom. *Open Journal of Social Sciences*. https://doi.org/10.4236/jss.2023.118007

Mellyani, L. S., Wahyudi, W., & Suhartono, S. (2022). Penerapan Model Problem Based Learning untuk Meningkatkan Keterampilan Proses dan Hasil Belajar IPA Materi Gaya dan Gerak pada Siswa Kelas IVA SDN 5 Panjer Tahun Ajaran 2021/2022. *Kalam Cendekia: Jurnal Ilmiah Kependidikan*. https://doi.org/10.20961/jkc.v10i3.62287

Menninga, A., Geert, P., Vondel, S., Steenbeek, H., & Dijk, M. (2021). Teacher-Student Interaction Patterns Change During an Early Science Teaching Intervention. *Research in Science Education, 52*, 1497–1523. https://doi.org/10.1007/s11165-021-09997-3

Moin, H., Majeed, S., Zahra, T., Zafar, S., Nadeem, A., & Majeed, S. (2024). Assessing the impact of jigsaw technique for cooperative learning in undergraduate medical education: merits, challenges, and forward prospects. *BMC Medical Education, 24*. https://doi.org/10.1186/s12909-024-05831-2

Muliati, M., Hanani, S., Sesmiarni, Z., Zakir, S., & M, I. (2025). Applying the Contextual Teaching and Learning Model to Enhance 21st Century Skills in Fikih Learning: A Case Study in Madrasah Aliyah. *AL-ISHLAH: Jurnal Pendidikan*. https://doi.org/10.35445/alishlah.v17i4.7941

Mutlu, A. (2020). Evaluation of students' scientific process skills through reflective worksheets in the inquiry-based learning environments. *Reflective Practice, 21*, 271–286. https://doi.org/10.1080/14623943.2020.1736999

Nazihah, N. (2026). Faktor Penyebab Rendahnya Partisipasi Belajar Siswa dalam Diskusi Kelompok Pada Pembelajaran Bahasa Indonesia Kelas IV SD Negeri 6 Metro Timur. UIN Jurai Siwo Lampung.

Nilawati, N. (2021). Upaya Meningkatkan Aktivitas Belajar Siswa dalam Pembelajaran IPA Melalui Model Pembelajaran Kooperatif Tipe Jigsaw di SMP Negeri 7 Bukittinggi Provinsi Sumatra Barat. *Jurnal Paedagogy*. https://doi.org/10.33394/jp.v8i3.3850

Pandiangan, A. P. B. (2020). *Penelitian tindakan kelas (sebagai upaya peningkatan kualitas pembelajaran, profesionalisme guru dan kompetensi belajar siswa)*. Deepublish.

Permatasari, D. N. (2023). Peningkatan Konsentrasi Belajar Siswa melalui Model Pembelajaran Cooperative Script pada Pembelajaran IPA. *INTELEKTIUM*. Retrieved from https://api.semanticscholar.org/CorpusID:255725786

Rahmi, D. A., Ma'wa, J., & Alim, J. A. (2024). Analisi Metode Pembelajaran Kooperatif Jigsaw Untuk Meningkatkan Keaktifan Dan Hasil Belajar Siswa. *Lencana: Jurnal Inovasi Ilmu Pendidikan, 2*(1), 35–41.

Ramadhanti, S. L., Konjin, H. C. T., Wadud, A. J., Nadlir, N., & Wakhidah, N. (2025). Model Pembelajaran Kooperatif Tipe Jigsaw dalam Pembelajaran IPA di Sekolah Dasar. *Journal of Instructional and Development Researches*. Retrieved from https://api.semanticscholar.org/CorpusID:279704703

Ramli, M., Susanti, B., & Yohana, M. (2022). Indonesian Students' Scientific Literacy in Islamic Junior High School. *International Journal of STEM Education for Sustainability*. https://doi.org/10.53889/ijses.v2i1.33

Rembang, K., & Rembang, K. (2021). Penerapan Metode Diskusi Kelompok Model

Pembelajaran Jigsaw untuk Meningkatkan Hasil. Retrieved from https://api.semanticscholar.org/CorpusID:233437913

Rismadani, R. P., Fuadiah, N. F., & Masnunah, M. (2026). Penerapan Etnomatematika Permainan Tradisional Engklek Dalam Pembelajaran Matematika Materi Bangun Datar Siswa Kelas 3 SDN 28 Banyuasin I. *Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar*. Retrieved from https://api.semanticscholar.org/CorpusID:285330723

Ristiani, R., Ali, A., & Apriyanto, A. (2025). *Konsep Dasar Pembelajaran IPA*. PT. Sonpedia Publishing Indonesia.

Rohman, F. A., Khairi, A. I., & Devi, B. (2024). Improving Students Learning Activeness in Social Studies Subjects through Student Teams Achievement Division (STAD) Cooperative Learning Model. *Entita: Jurnal Pendidikan Ilmu Pengetahuan Sosial Dan Ilmu-Ilmu Sosial*. https://doi.org/10.19105/ejpis.v6i1.13610

Ruspandi, J. (2021). Penerapan Model Pembelajaran Kooperatif Model Jigsaw Untuk Meningkatkan Keaktifan Siswa Dan Hasil Belajar Ips Materi Dampak Globalisasi Dalam Kehidupan Masyarakat Siswa Kelas Vi Sekolah Dasar Negeri Wanareja 03. *Jurnal Insan Cendekia*, *2*(2), 33–50.

Santosa, R. B. (2023). Peningkatan Kompetensi Guru dalam Menulis Proposal Penelitian Tindakan Kelas melalui Pelatihan dengan Model Pembelajaran Andragogi. *Ideguru: Jurnal Karya Ilmiah Guru*. Retrieved from https://api.semanticscholar.org/CorpusID:259379643

Soedimardjono, F. P., & P, P. (2021). Cooperative Learning Model with Jigsaw Type Improves Students' Sciences Process Skills and Learning Outcomes, *10*, 172. https://doi.org/10.23887/jpi-undiksha.v10i1.25203

Suwartono, T., & Romdona, Y. (2024). The Jigsaw Learning Model to Promote Engagement in the English Language Classroom: A Teacher's Reflection. *Acta Pedagogia Asiana*. https://doi.org/10.53623/apga.v3i2.401

Utami, S., Nurhadi, D., & Yoto, Y. (2023). Pembelajaran Berdiferensiasi Sebagai Upaya Pemenuhan Kebutuhan Gaya Belajar Peserta Didik Pada Mata Pelajaran Project IPAS di SMKN 1 Kademangan. *Belantika Pendidikan*. https://doi.org/10.47213/bp.v6i2.201

Wahyono, A. B., Rasul, A., & Wadaron, D. (2022). Efforts to Improve Mathematics Learning Outcomes on Fractional Material by Using a Jigsaw-Type Cooperative Learning Model. *PEDAGOGIC: Indonesian Journal of Science Education and Technology*. https://doi.org/10.54373/ijset.v1i1.54

Wahyuningsih, E. S. (2020). *Model pembelajaran mastery learning upaya peningkatan keaktifan dan hasil belajar siswa*. Deepublish.

Zainuri, R. D., Khadijah, I., Haerudin, H. H., & Sasmita, M. (2026). Model-model Pembelajaran Inovatif sebagai Implementasi Kurikulum PAI yang Responsif terhadap Perubahan Zaman. *Jurnal Ilmiah Profesi Pendidikan*. Retrieved from https://api.semanticscholar.org/CorpusID:286281073

Zulirfan, Z., Yennita, Y., Rahmad, M., & Purnama, A. (2021). Desain dan Konstruksi Prototype KIT Proyek STEM Sebagai Media Pembelajaran IPA SMP Secara Daring pada Topik Aplikasi Listrik Dinamis. Retrieved from https://api.semanticscholar.org/CorpusID:235565268