Students' Mathematic Reasoning: a Review from Jigsaw and ROPES Learning Model at Baiti Jannati Junior High School

Mara Samin Lubis
Fakultas Ilmu Tarbiyah dan Keguruan, UIN Sumatera Utara Medan
Email : marasamin@uinsu.ac.id

Abstract

The background of this article is that the learning carried out by the teacher in the classroom only focuses on the teacher, the class condition is not effective. This study aims to see the difference between the mathematical reasoning of students who are taught using the jigsaw learning model and the ROPES (Review, Overview, Presentation, Exercise) learning model in class VIII SMP Baiti Jannati on Prisma material. This research is a quantitative research that uses the entire population of class VIII with a sample of class VIII-1 and VIII-2 with a total of 30 students in each class. This study uses a one-way ANOVA test using a description test. Based on the results of this study indicate that there is a difference between the jigsaw and ROPES learning models with Fcount > Ftable; 26.89 > 4.07. The mathematical reasoning of students reviewed using the jigsaw learning model is better than the mathematical reasoning of students reviewed using the ROPES learning model on Prisma material in class VIII SMP Baiti Jannati.

Keywords: *Students' Mathematical Reasoning; Cooperative Learning Type Jigsaw; ROPES Learning Model.*

Abstrak

Penulisan ini dilatarbelakangi karena pembelajaran yang dilakukan guru dalam kelas hanya berfokus pada guru, keadaan kelas tidak efektif. Penelitian ini bertujuan untuk melihat perbedaan antara penalaran matematis siswa yang diajar dengan menggunakan model pembelajaran jigsaw dengan model pembelajaran ROPES (*Review, Overview, Presentation, Exercise*) di kelas VIII SMP Baiti Jannati pada materi Prisma. Penelitian ini berjenis penelitian kuantiatif yang menggunakan populasi seluruh kelas VIII dengan sampel kelas VIII-1 dan VIII-2 dengan jumlah 30 siswa setiap kelas. Penelitian ini menggunakan uji ANAVA satu jalur dengan menggunakan tes uraian. Berdasarkan hasil penelitian ini menunjukkan bahwa adanya perbedaan antara model pembelajaran *jigsaw* dan ROPES dengan Fhitung > Ftabel; 26,89 > 4,07. Dimana penalaran matematis siswa yang ditinjau menggunakan model pembelajaran jigsaw lebih baik dari pada penalaran matematis siswa yang ditinjau dengan menggunakan model pembelajaran ROPES pada materi Prisma di kelas VIII SMP Baiti Jannati.

Kata Kunci: Penalaran Matematis Siswa; Pembelajaran Kooperatif Tipe Jigsaw; Model Pembelajaran ROPES.

*Correspondence:
Email: marasamin@uinsu.ac.id

INTRODUCTION

Education is urgently needed to cultivate children's potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society and the state. Education is an aspect of life that has a valuable contribution. To become a developed country in terms of technology, good quality education is needed. Technology makes it easy for humans to reach abundant data from various sources in the world (Rahmi, 2016: 47). In addition, technological developments also require human expertise (HR) who are proficient and ready to compete in all fields. People need basic, precise, reasonable and inventive speculations to understand and select the data obtained. The development of education in Indonesia that needs to be considered is that education will be maximally successful when every element of education always adheres to national goals. The educational objectives of UU.No. 20 of 2003 states that: "The purpose of national education is to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the nation's life, aiming to develop the potential of students to become human beings of faith and piety to the One and Only Purpose, noble character, capable, creative, independent, and become a democratic and responsible citizen. This can be obtained from learning mathematics (Tanti, 2014: 158). Mathematics is a field of study that is taught in every learning setting from elementary school to university. Mathematics is very important because it is useful in life (Titin, 2018: 201).

However, the OECD reports the results of the PISA study a score of 379 with an order of 73 out of 79 rather than China's score of 591 which is in first place (Sulistyo, 2021: 282). In 2011, the results of the TIMSS study showed that Indonesia was ranked 38th out of 42 countries with a score of 386 and 397 in 2015 ranked 44th out of 48 countries with a score of 39 (Hendri, 2020: 116). Given the importance of the position of mathematics in improving human resources, efforts to improve the quality of mathematics learning resources require serious attention. In the arrangement of mathematics, students tend to be passive and the arrangement of mathematics in the classroom does not engage students actively (Listika, 2016: 79). When the teacher ends explaining the subject matter

and allowing students to ask questions, students just stay silent so that when students work on questions that are different from the example, the students do it wrong (Yufitri, 2018: 54). This matter is closely related to the low mathematical thinking skills of students.

Nowadays mathematics material often focuses on theory alone not based on students' learning experiences (Eka, 2014: 10) Mathematics learning in class still occurs conventionally where students only take notes and heed what is written and explained by educators in class (Davi, 2017: 159) . So that the teacher plays an active role and students become passive. Based on this, it indicates that the learning used is a conventional model with an expository type where the teacher is the source of learning. Students as passive objects in this learning and students' experiences are not seen directly to form their own descriptions of the material being studied.

This is also in accordance with the results of an interview with a mathematics teacher at Baiti Jannati Junior High School which coincided on February 26, 2021, there were cases that hindered the achievement of the mathematics learning process, namely the learning process did not support students to be active in class so that students were less able to solve the questions given by the teacher. Moreover, the prism material which is a mathematical subject that is difficult for students to understand, as stated by a mathematics teacher at SMP IT Baiti Jannati reported that the prism material is poorly understood by students due to the weak knowledge of students' prerequisites. More specifically he said "There are students working on the surface area of a triangular prism but do not recognize the method of finding the area of the base of a triangle". From these comments, it can be seen that prerequisite knowledge is very useful in solving prism problems. In this regard, it is emphasized that the factors that cause difficulties in learning the prism of the subject matter are that there are students who have not mastered the prerequisite material and students incorrectly determine the formula, theorem or definition to respond to a problem (Dessy, 2020: 68).

From the statement above, it is necessary to make efforts to improve students' mathematical reasoning and to achieve educational goals, considering the importance of mathematics in all aspects of life. By using a variety of mathematical learning models or producing a learning atmosphere that is fun, not constant and not boring, so students are interested in learning mathematics (Syahrul, 2020: 279). Among the various arrangements applied in mathematics, the jigsaw learning model is expected to be fun and ROPES, Presentation, exercise, summary. researchers need to look at the differences in the mathematical reasoning abilities of students who are taught using the jigsaw and ROPES models.

According to Munasiah, et al. thinking capacity is the capacity of students to reach conclusions depending on reality and existing sources. as pointed out by the National Council of Teachers of Mathematics (NCTM) the principles of numerical thinking are (a) with respect to thinking being a basic component of arithmetic; (b) make and dissect numerical guesses; (c) improve and check mathematical reasoning; and (d) select and use various types of reasoning. So it can be concluded that mathematical thinking skills are the ability to use mathematical logic to get an accurate conclusion.

Jigsaw was introduced by Elliot Aronson with his best friend and then processed by Slavin and his best friend (Fathurrohman, 2015: 62). The Jigsaw type cooperative arrangement is a cooperative arrangement in which students study in small groups of 4-5 students who are diverse in the original team and the expert team, so that students can collaborate and be responsible for the results of their group work (Riri, 2020: 202). Jigsaw cooperative learning is a learning model that divides students into several groups and then systematically breaks down the groups to discuss with other group members in a section of material and special groups and then return to the initial group and convey the results of their discussion with the special group. That is, members of the initial group have each responsibility for mastering certain parts of the material by finding out and discussing it with members of the shadow group so that they can teach it to the initial group. As stated by Fathurrohman (2015: 63) that the jigsaw learning

model is a cooperative learning technique consisting of several members in one group who are responsible for mastering the learning material section and are able to teach the material to other members in the group.

Specifically, the Jigsaw cooperative learning model divides students into several groups. Each group has an expert who is required to master one part of the material being studied. Furthermore, all experts from each group unite to form an expert group to study and discuss the part of the material that they must master. After that, all members of the expert group returned to their respective home groups and shared the results of their discussions.

According to Rusman (2018: 217) the word jigsaw comes from English which means jigsaw and some also interpret it as a puzzle which means a puzzle assembling pieces of a picture. This type of jigsaw cooperative learning takes the pattern of how to work a saw (zigzag), where students carry out a learning activity by working together between groups with students from other groups (expert groups) to achieve common goals.

Based on the explanation above, it is not surprising if Isjoni (2019: 77) argues that the jigsaw type cooperative learning model is one type of cooperative learning model that encourages students to be active and help each other in mastering learning materials to achieve maximum achievement. Jigsaw is one type, type, or derivative of the cooperative learning model that prioritizes the cooperation of students in the process. However, the zig-zag touch given by the jigsaw can be said to further sharpen the cooperation that occurs. So that participants really must be able to be responsible to themselves and many other colleagues in one row.

Before using the jigsaw strategy, the teacher must first understand how to group students. The thing that must be considered in grouping students is that group members are sought to be heterogeneous. Group heterogeneity includes gender, race, religion (if possible), ability level (high, low, moderate), and so on. The technique for grouping students can be taken based on the sociometric method, based on the similarity of numbers, or using a random technique (Nurhadi, 2004:68). While the learning procedure with the jigsaw strategy

according to Malvin (2004: 193-194) are: 1) Choose learning materials that can be broken down into several parts. A section can be as short as a sentence or as long as several paragraphs. (If the material is long, instruct students to read their assignments before class); 2) Count the number of sections to be studied and the number of students. Distribute assignments equitably among different groups of students. For example, imagine a class of 12 students. Suppose that you can divide the subject matter into three segments or sections. You may then be able to form a quartet (group of four members) by giving each group 1, 2 or 3 segments. Then instruct each "study group" to read, discuss, and study the material they received first. 3. After the study time is over, form "jigsaw learning" groups. The group consists of representatives from each "study group" in the class. In the example just given, the members of each quartet can count from 1, 2, 3 and 4. Then form a jigsaw study group of the same number. The result is a trio group. In each trio there will be one student who has studied segment 1, segment 2 and segment 3. 4. Instruct members of the jigsaw group to teach one another what they have learned. 5. Instruct students to return to their original position in order to discuss the remaining questions to ensure accurate understanding.

The best way to understand the jigsaw type of cooperative learning model is to know firsthand how the syntax is, as well as the steps or procedures. According to Rusman (2018: 220), the steps of the jigsaw type cooperative learning model are as follows: 1) Students are grouped with about 4 members; 2) Each person in the group is given different materials and tasks; 3) Members of different groups with the same assignment form a new group (expert group); 4) After the expert group discussed, each member returned to the original group and explained to the group members about the sub-materials they mastered; 5) Each expert group presented the results of the discussion; 6) Discussion; and 7) Closing.

Meanwhile, the steps, syntax, or application of the jigsaw learning model according to Yamin (2013: 94) are as follows.

a. The teacher divides a class into several groups, with each group consisting of 4 to 6 students with different abilities. This group is called the home

group. The number of members in the original member adjusts to the number of parts of the subject matter to be achieved. In the Jigsaw technique, each student is given the task of studying one part of the learning material. All students with the same learning material study together in groups called expert groups. In expert groups, students discuss the same part of the material, and make plans how to convey it to their friends when they return to their original group.

b. After students discuss in expert groups or in their home groups, then each group will present a presentation or draw a draw for one of the groups to present the results of the group discussions that have been carried out so that the teacher can equate perceptions of the learning material that has been discussed.
c. The teacher gives quizzes to students individually.
d. The teacher gives awards to the group through an award score based on the acquisition of an increase in individual learning outcomes from the basic score to the next quiz score.
e. The material should naturally be divided into several parts of learning material.
f. It should be noted that if using Jigsaw to learn new material, it is necessary to prepare a guide and content that is coherent and sufficient, so that the learning objectives can be achieved.

Based on the concept that students are responsible for themselves and their groups, and must be able to become delegates and help others, jigsaw is one of the most optimal applications of cooperative learning. Almost all the criteria and indicators of cooperation will appear by themselves. How not, all the main concepts of cooperative learning are present in a strong form which are combined in one activity. However, this may also make it more difficult to implement. Jigsaws can become too complex and convoluted for both teachers and students. In this regard, here are some of the advantages and disadvantages that surround the jigsaw type cooperative learning model.

According to Hamdayama (2014: 83) the jigsaw learning model has several advantages, including the following.

a. Facilitate the work of teachers in teaching, because there is already a group of experts in charge of explaining the material to their group colleagues.
b. Even distribution of mastery of the material can be achieved in a shorter time.
c. This learning model can train students to be more active in speaking and arguing.

Furthermore, Ibrahim (Majid, 2017: 184) suggests that the advantages of the jigsaw learning model are as follows.

a. Can provide opportunities for students to work together with other students.
b. Students can master the lessons delivered better.
c. Each student member has the right to be an expert in his group.
d. In the teaching and learning process students are positive interdependence.
e. Each student can complement each other.

Meanwhile, the weaknesses of the jigsaw learning model according to Hamdayama (2014: 83) are as follows.

a. Active students will dominate the discussion and tend to control the course of the discussion.
b. Students who have lower reading and thinking skills will have difficulty explaining the material if they are appointed as experts.
c. Students who are smarter will tend to feel bored when receiving explanations from colleagues who are less equal to them.
d. The risk class division is not heterogeneous, because of the possibility of forming groups whose members are all less prominent or vice versa.
e. Assignment of class members to become a team of experts often does not match the abilities and competencies that must be learned.
f. Students who are not used to competing will find it difficult to follow the learning process.

Ibrahim (Majid, 2017: 184) also points out some of the weaknesses of the jigsaw which include some of the points below.

a. Takes a long time.
b. Smart students tend not to want to be put together with their less intelligent friends and those who are less intelligent also feel less confident when combined with their friends who are considered smarter, although over time that feeling will disappear by itself.

In addition to using the Jigsaw Learing Model, students' mathematical reasoning abilities using the ROPES Learning Model are also seen in this study. The ROPES argument was first proposed by Hunts. ROPES learning is a draft of study rules as a teaching plan called ROPES (Majid, 2009: 99). ROPES arrangement is an arrangement consisting of several structured activities starting from a review, overview presentation, exercise, and summary (Vinsensius, 2020: 39).The ROPES learning model is considered appropriate in an effort to empower and develop students' abilities. In this learning model, it provides greater opportunities for students to find sources and materials, compose, discuss in small groups and present in class plenary. After the presentation by the small group on duty, it was followed by a class discussion to clarify and enrich the material presented by the group. After the discussion was refined by the teacher and continued with an oral or written evaluation. Next, the teacher and students make a summary of the material that has been studied. The ROPES Learning Model is more of a study that combines several types of learning models and learning approaches. ROPES is used as an alternative model for learning in schools based on the results of observations since the 2006/2007 academic year presented now. The ROPES Learning Model is also used as a solution to the monotony of learning carried out by teachers with a learning model that has not been updated from time to time.

This ROPES Learning Model has been tested for the first time on students of the Teaching Deed Program class of 2006/2007 and every subsequent batch until the class of 2010/2011, the average student responded that this model is the most appropriate for use in lectures for teaching certificate students who on average is a bachelor and diploma three. Furthermore, in the 2008/2009 academic year, it was started to be used on regular first semester students, it turned out that

based on the results of observations showed that this learning model encouraged students to be more active in doing assignments outside of class hours and to be active in discussions in the lecture hall, both as presenters. assignment material and as a discussion (Lohmay, 2009: 2). Several studies on the application of the ROPES learning model show that: (1) The application of the ROPES learning model can be concluded that it increases economic activity and learning outcomes at SMA Negeri 1 Lumajang in class X-3 students in the odd semester of the 2011/2012 school year (Usman Kurniawan, 2011) . (2) Dame Yanti C. Silitonga (2013) tested the effect of the ROPES learning model on the ability to write short stories in class X SMA Negeri 14 Medan in the 2013/2014 academic year, and concluded that using the ROPES learning model was better than the results of the ability to write short stories using the ROPES learning model. Conventional learning model for students of class X SMA Negeri 14 Medan in the 2013/2014 academic year. (3) Hunts (in Madjid, mentions the learning procedure plan as teaching preparation which he calls ROPES with the steps of Review, Overview, Presentation, Exercise, Summary. ROPES is applied in teaching preparation by teachers and in the third step they use the term exercise). In this study, the authors use evaluation. For the authors, evaluation is broader than just an exercise, in the evaluation it also includes exercises. Plans and 2008) there is no evaluation step. Exercise as the fourth step of the Hunts lesson plan, is a process to provide opportunities for students to practice what they have understood. This is intended to provide direct experience to students so that the results achieved are more meaningful. Therefore, teachers/lecturers must prepare lesson plans well through scenarios that test the effect of implementing the ROPES learning model with peer tutoring.

The ROPES model can be concluded as a learning model formed through stages in teaching preparation based on a review of past learning (Review), building students' thinking framework (Overview), presenting new material (Presentation), giving training (Exercise) and making a summary of new material (Summary) to be taught in order to improve student learning outcomes.

The ROPES learning model research has been widely used in research in educational institutions, among others, by lecturers at universities and teachers in junior and senior high schools. All the research results above indicate that the ROPES learning model is feasible and effective to be used as a learning model that not only empowers students' abilities, but also activates and encourages the completion of tasks effectively and efficiently.

The ROPES learning aimed at solving student learning problems began to shift rapidly in one era from order to diversity. Degeng (1998) calls it the era of chaos, and that era is ongoing. This era is very demanding for designers and learning developers to carry out various adaptations and innovations to learning models which seem to be the time to be updated, collaborated and developed. Efforts to adjust and update these learning models aim to present learning models that have characteristics that are in accordance with the demands of learning needs at every level and type of education as well as the characteristics and development of students/students as learners.The foundation of the ROPES learning model is cognitive learning theory, which is based on the following principles: (1) learning and development depend on the experience of the student (student); (2) People want their experiences to make sense; (3) people construct knowledge to understand their experiences; (4) the knowledge that students (students) build depends on their previous knowledge and experience; (5) social interaction and language use facilitate knowledge building; (6) learning demands practice and feedback, and (7) learning increases when learning experiences are linked to the real world (Eggen and Kauchak, 2012: 54). ROPES stands for: Review, Overview, Presentation, Evaluation, Summary. The ROPES Learning Model is the result of adaptation of various types of learning models and adapted to the demands of the curriculum. The ROPES Learning Model is also a development of the types of learning models that already exist and is more an adaptation of various learning models such as in the categories of models: (1) information processing, (2) social interaction, (3) personal, and (4) focus on achieving learning objectives (Lohmay, 2009).

The ROPES learning model is also a learning model that is more developed and empowers students' abilities in finding, finding sources, and concocting material in the form of learning outcomes which can then be presented in lectures in class, as well as opening up discussion rooms. as part of the responsibility for the task followed by correction. improvement by the lecturer as a facilitator in learning. If observed from the above understanding, at least the ROPES learning model has several advantages in overcoming the weaknesses of learning in higher education, including: (1) Developing students' intellectual abilities in cognitive, affective and psychomotor aspects. (2) Empowering students to achieve a more optimal level of development. (3) Making students later become scientists who are productive and not consumptive. (4) Can develop students' self-potential. (5) The role of lecturers as resource persons and facilitators. Based on the results of observations when implementing the ROPES Learning Strategy in various lecture classes, the psychological contribution can be described as follows: (a) Students freely and actively seek sources from various references to obtain lecture material which is their task to study. (b) On average, students are able to work together in compiling coursework in a relatively short time. (c) Individual weaknesses are overcome by learning together in the form of discussions and working on group assignments. (d) On average, students show their creativity in reviewing and presenting the material that is their group assignment. (e) When presenting assignments, it is more demanding for students to develop reasoning and communication skills. (f) The learning atmosphere is more creative in the context of student self-development, and (g) The relationship between lecturers and students in a learning atmosphere is more of a partnership so that the psychological pressure felt by certain students can be overcome.

The steps of the ROPES (Review, Overview, Presentation, Exercise, Summary) learning model are:

1. Review, This activity is carried out within 1 to 5 minutes, which is to try to measure the readiness of students to learn teaching materials by looking at the previous experiences that students have had and are needed as a prerequisite for understanding the material delivered that day. This is required based on:

1) The teacher starts the lesson, if the attention and motivation of students to learn new material has started to grow.
2) The teacher wants to start the lesson, if the interaction between the teacher and students has begun to form.
3) The teacher can start learning if students already understand the relationship between the previous teaching material and the new teaching material that was learned that day.

Teachers must be sure and know very well if students are ready to accept new lessons. If students have not mastered the previous lesson, the teacher must wisely provide opportunities for students to understand it first or enlighten it through giving assignments, explanations, guidance, peer tutors, and just moving on to the previous material. If there is an accumulation of delayed teaching materials, additional time must be sought, because it is better to postpone new teaching materials than to accumulate student misunderstandings.

2. Overview, Like the review, the overview is not too long ranging from 2 to 5 minutes. The teacher explains the learning program that will be carried out on that day by briefly conveying the content and strategies that will be used in the learning process. This is intended to provide opportunities for students to express their views on the learning steps to be taken by the teacher so that the learning process does not only belong to the teacher, but the students also feel happy and feel valued for their existence.
3. Presentation, This stage is the core of the process of teaching and learning activities, because here the teacher no longer gives brief explanations, but has entered the telling, showing, and doing process. This process is very necessary to improve the absorption and memory of students about the lessons they get. The more varied the process of learning strategies used, the better the process and the results achieved, because it does not make students bored, but leads them to enjoy the learning process in a fun and enjoyable atmosphere.

4. Exercise, That is a process to provide opportunities for students to practice what they have understood. This is intended to provide direct experience to students so that the results achieved are more meaningful. Therefore, the teacher must prepare the lesson plan well through systematic scenarios. students who must be given through demonstrations, assignments (tasks), demonstrations and so on.
5. Summary, Intended to reinforce what they have understood in the learning process. This is often left behind by the teacher because the teacher is busy with presentations, and maybe even the teacher never makes a summary (conclusion) of what the teacher has taught. The odd thing about the learning procedure proposed by Hunts is that it does not include the assessment aspect, even though the results of the assessment, in addition to measuring the level of student competency attainment, can also be used as input to make improvements in the next learning process. To complement Hunts' thinking, the teacher would be able to include an element of assessment, because it is through the assessment that the teacher gets a picture of the level of mastery of the students on the material presented so that they can develop the material being taught and can develop the material that will be presented at the next meeting.

As a learning model, of course, each has advantages and disadvantages. The advantages of the ROPES Model are: 1) Students will feel more valued because they participate in submitting opinions about the learning strategies that will be implemented; 2) Encourage students to think and work on their own initiative, to be objective, honest and open so that students will be more challenged in learning; 3) By experimenting students will be more motivated in learning and not easily bored; 4) Can develop individual talents and skills; 5) Encourage students to be able to formulate their own hypotheses.

Furthermore, the limitations of this ROPES model are: 1) If students have not mastered the previous lesson, the teacher must wisely give students the opportunity to understand it first, so that it will reduce the time for delivering the

material; 2) If there is an accumulation of delayed teaching materials, additional time must be found.

The learning proposed by Hunts is that it does not include the assessment aspect, even though the results of the assessment in addition to measuring the level of achievement of student competencies can also be used as input to make improvements for the next learning.

Mathematical reasoning is based on a person's ability to find solutions, carry out assessments and apply mathematical thinking (Mevarech & Kramarski, 2014). It can be synthesized that the ability of mathematical reasoning is the ability of a person by using his mind to draw a conclusion based on existing mathematical premises and is believed to be true, by looking at the relationships that exist between these premises. There are six indicators of students' mathematical reasoning ability in Permendikbud number 58 of 2014, namely: students are able to make conjectures, are able to perform mathematical manipulations, are able to draw conclusions, compile evidence, provide reasons or evidence for the correctness of solutions, be able to draw conclusions from statements, be able to check validity an argument and be able to find patterns or properties of mathematical phenomena to make generalizations. The six indicators serve as a reference for research instruments to measure students' mathematical reasoning abilities.

Keraf, and Shurter and Pierce (Sumarmo, 1987) define the term reasoning as a thinking process that includes activities to draw logical conclusions based on existing data and events or relevant sources. Broadly speaking, in terms of how to draw conclusions, mathematical reasoning is classified into two types, namely inductive reasoning and deductive reasoning. Inductive reasoning is drawing conclusions based on observed data. The truth value in inductive reasoning can be true or false. Some types of inductive reasoning are: transductive, analogy, generalization; predict answers, solutions or trends, interpolate and extrapolate; provide an explanation of the existing model, fact, nature, relationship, or pattern; using relationship patterns, analyzing and synthesizing several cases, and compiling conjectures (Sumarmo, 1987). Deductive reasoning is drawing

conclusions based on agreed rules. The truth value in deductive reasoning is absolutely true or false and not both together. Some activities that include deductive reasoning include: carrying out calculations based on certain rules or formulas; draw logical conclusions based on inference rules, check the validity of arguments, analyze and synthesize several cases, compose direct proofs, indirect proofs and proofs by mathematical induction (Sumarmo, 1987). With regard to learning mathematics, NCTM (1989) suggests that the mathematics curriculum should include logical reasoning skills, including: a) recognizing and applying deductive and inductive reasoning; b) understand and apply the reasoning process; c) create and evaluate conjectures and logical arguments; d) assess the power of reasoning as a part of mathematics. Similar to the opinion above, Ebut and Draker (Depdiknas, 2007) state that mathematical reasoning skills that need to be developed in students include: a) understanding the meaning of mathematical concepts/rules; b) logical thinking; c) understanding is not an example; d) define and explain the steps of working on the problem so that it can be understood by others; e) compare and select effective and efficient measures; and f) correcting the wrong processing steps.

RESEARCH METHODS

This research was conducted at SMP IT Baiti Jannati. Data were collected using observation and tests. This research is included in Quasi Experimental research. This research is included in quantitative research and the researcher does not change the sample in the circumstances desired by the researcher. The design in this study uses a "Pre-test-post-test non-equivalent control group" design where the researcher will know in advance the students' initial abilities by conducting a pre-test before the researchers carry out learning with mental learning, after the learning process with the specified subject is complete. then to determine the mastery of the material that has been studied the researchers conducted a post-test. To find out the mathematical reasoning of students who are taught using the Jigsaw and ROPES learning models, it can be seen from the score of the reasoning grid according to the indicators below:

Table 1. Criteria Score Mathematical Reasoning

Score	Criteria
4	The answers are substantially
3	The answer contain one significant error or omission
2	As a correct answer with one or significant errors or omissions
1	As an incomplete answer but contains at least one correct argument
0	The answer is not correct based on the process or argument, ot there is no response at all

The scoring guidelines or categories of students' mathematical reasoning abilities can be seen in the following table. For more details, the research flow can be described as follows:

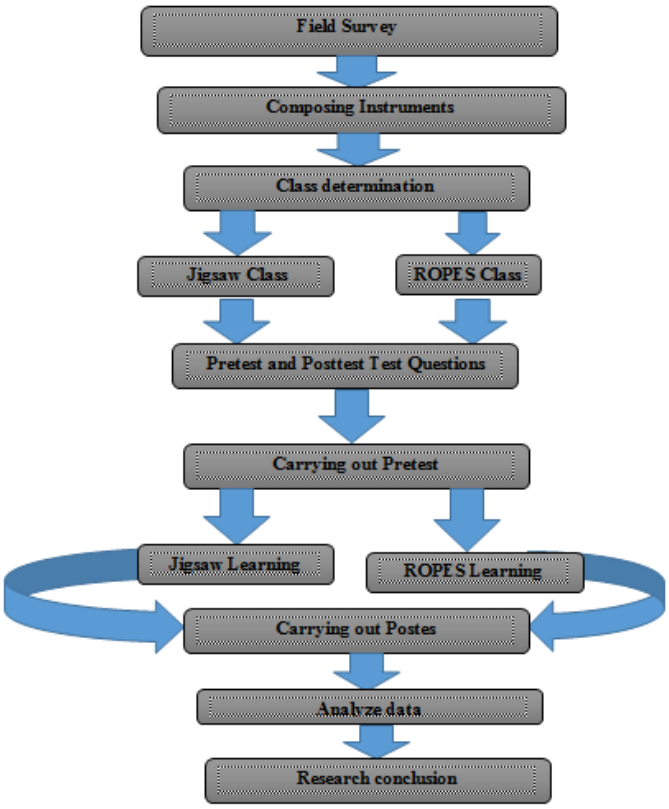

Figure 1. Research Flow

With the implementation at Baiti Jannati IT Middle School in the odd semester of the 2021/2022 school year. The population of this study were all eighth grade students of SMP IT Baiti Jannati. Furthermore, the research sample is this is a class VIII SMP IT Baiti Jannati class VIII-1 and VIII-2 with a lot of 30 students per class with an arbitrary group examination procedure. Class VIII-2

experiment 1 was taught with the Jigsaw arrangement and class VIII-1 experimental class 2 was taught with the ROPES arrangement.

Data were collected using observation sheets, namely the accumulation test instrument used was a test of reasoning thinking skills in the form of a description with 5 questions.

The mathematical reasoning ability test was carried out in 2 classes, namely experimental class 1 and experimental class 2. The test was taken from the lesson grid with prism material. Before the test is used, a trial is carried out to see if it meets the requirements. To describe student understanding data on prismatic subjects based on the treatment group, the data were analyzed using descriptive statistics, namely by calculating the average score or mean (M), standard deviation or standard deviation (S) and variance, then viewed normality and homogeneity tests. which is a requirement for the ANOVA test to see differences in reasoning abilities in terms of the jigsaw and ROPES learning models.

RESULTS AND DISCUSSION

From the results of the written test on 30 students in the form of an assessment instrument for the mathematical reasoning ability test as many as 5 description questions. The results of this study are data obtained from the analysis of students' answers based on the reference guidelines for scoring mathematical reasoning abilities. The findings found that:

Table 2. Summary of Mathematical Reasoning Abilities

SUMMARY OF ANALYSIS RESULTS		
VARIABLE	**Students' Reasoning in terms of the Jigsaw Pembelajaran Learning Model**	**Students' Reasoning in terms of the ROPES Learning Model**
N	30	30
TOTAL	2300	1855
MEAN	76,7	61,8
SD	9,767	12,421
VARIANS	95,402	154,282
TOTAL SQUARE	179100	119175

In the data above, the data has different variances, as can be seen in the histogram below:

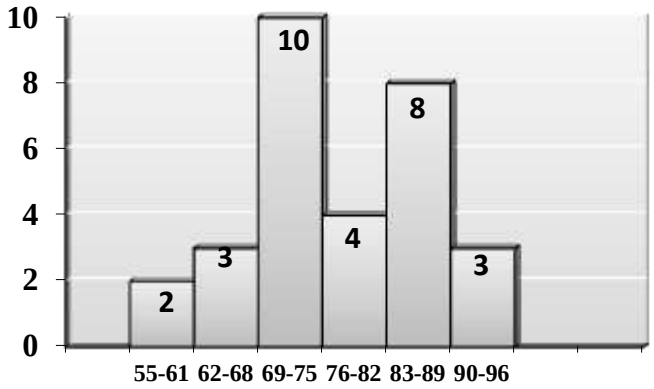

Figure 2. Histogram of Mathematical Reasoning reviewed through the Jigsaw Learning Model

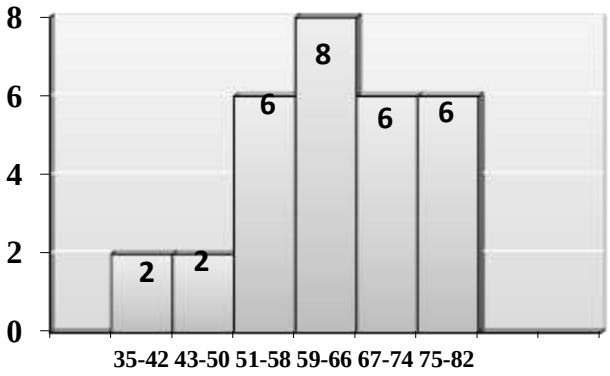

Figure 3. Histogram of Mathematical Reasoning reviewed through the ROPES Pembelajaran Learning Model

In the findings, it was found that the data had normality. The data was tested with the normality test using the Liliefors formula as follows:

Table 3. Normality Test

Groups	L – Count	L - Table α= 0,05	Conclusion
Pretes			
X_1Y	0,153	0,162	Ho : Accepted, **Normal**
X_2Y	0,130		Ho : Accepted, **Normal**

Based on the table above, that the differences in the mathematical reasoning of students who are reviewed through the jigsaw learning model have a

normal distribution, as well as the mathematical reasoning of students who are reviewed using the ROPES learning model has a normal distribution.

After doing the normality test, the data continued with the homogeneity test. For homogeneity testing, the similarity test of the two variances is used, namely the F test. If Fcount is F_{table} then Ha is rejected and if $F_{count} < F_{table}$ then Ha is accepted. With degrees of freedom of the numerator = $(n_1 - 1)$ and the degree of freedom of the denominator = $(n_2 - 1)$ with a significance level of =0.05.

Table 4. Homogeneity Test

Formula	F_{Count}	F_{Table}	Decision
$F\ count = \frac{largest\ Veriance}{Least\ Variance}$	1,617	1,861	**Homogeneous**

After testing for normality and homogeneity, the data was continued with the one-way ANOVA test to see the significance of the differences in students' mathematical reasoning which was reviewed with the jigsaw and ROPES learning models. The results of the calculations can be seen in the table below:

Statistical Hypothesis:

Ho : X_1 Y=X_2 Y

Ha : X_1 Y≠X_2 Y

Accept Ho, if: Fcount >Ftable

X1 : Jigsaw Learning Model

X2 : ROPES Learning Model

Y : Student Mathematical Reasoning

Table 5. Anova Calculation Results

Source of Variant	Sum of Squares	Degrees of Freedom	Average Number of Squares	F_{Count}	F_{table}	Decision
Intergroup (A)	3300,42	1	3300	26,89	4,07	**Accepted**
In group (D)	7241	59	123			
Total	10541,25	60				

Based on the calculation of the ANOVA test above, that there is a difference between mathematical reasoning that is reviewed using the jigsaw and ROPES learning models. The results of the calculation show that the average value of students' mathematical reasoning reviewed using the jigsaw learning model is better than the ROPES learning model. In line with the results of research by Siti Suprihatin (2017: 93) which states that there is an influence of the jigsaw learning model on the learning outcomes of Indonesian society studies. With the varied learning given to students, students' mathematical reasoning can be formed and pushed out. Besides the activities and creativity that are expected in a learning process that requires balanced interaction, the intended interaction is the interaction or communication between students and students and between students and teachers. In the learning process, it is expected that there will be communication in many directions that will allow the expected activities to occur. This of course depends on the learning model used, because the model used will assist in displaying the intended learning outcomes. In addition, the learning model determines whether students can interact with students only or between students and teachers. Reasoning will be created if there is communication in many directions, namely between students and teachers and also between students and students. In this case the selection of the jigsaw learning model can help students to communicate in many directions, with the jigsaw learning model students will interact in their groups. Thus this proves that the learning given to students interacts with students' mathematical reasoning. Based on the findings that have been described above, the findings in this study illustrate that mathematical reasoning can be developed using the jigsaw learning model where when viewed from the average value of students' mathematical reasoning reviewed using the jigsaw model of 76.7, while The students' mathematical analysis that was reviewed through the ROPES learning model had an average score of 61.8. In jigsaw learning, this is in accordance with constructivism learning theory which emphasizes the interaction between peers. According to Piaget and Vigotsky's views, there is a social nature of a learning process and also

about the use of learning groups with diverse members' abilities, resulting in conceptual change (Rusman, 2018: 202).

CONCLUSION

Judging from the consequences of exams and conversations on learning that there are differences in thinking skills between students who are shown using the jigsaw learning model and students who show using the ROPES learning model on prism material in class VIII. Baiti Jannati IT Junior High School. This can be seen from the results of the investigation of fluctuations that Fcount = 26.89 and the value of Ftable 4.07 and it can be said that the mathematical reasoning ability of students who are guided by the jigsaw learning model is superior. with the ROPES learning model.Observing the objectives contained in the final exam, the authors convey the ideas, among others: (1) for educators, learning with a jigsaw arrangement is better in developing students' numerical thinking skills so that learning with this arrangement can be used in everyday life. learning system. (2) for schools, this test can be used as information and additional data. (3) for the following specialists, it is advisable to lead this exam with different materials to work on the quality and nature of training in mathematics learning.

REFERENCES

Astuti, T.P., Masykur, R., dan Pratiwi, D.D. (2018). Pengaruh Model Pembelajaran TANDUR Terhadap Kemampuan Pemahaman Konsep dan Penalaran Matematis Peserta Didik. Aksioma: Jurnal Pendidikan Matematika FKIP Univ. Muhammadiyah Metro, 7(2), 201-209.

Burais, L., Ikhsan, M. dan Duskri, M. (2016). Peningkatan Kemampuan Penalaran Matematis Siswa Melalui Model Discovery Learning. Jurnal Didaktik Matematika, 3(1), 77-86.

Eggen, P. & Kauchack, D. 2012a. Startegie and Models for Techers: Teaching Contents and Thinking Skills. New Jersey: Prentice Hall Inc. Englewood Cliffs.

Eggen, P. & Kauchack, D. 2012b. Startegi dan Model Pembelajaran: Mengajarkan Konten dan Keterampilan Berpikir. (Alih Bahasa : Satrio Wahono). Jakarta: PT. Indeks

Eka, P., Sadia, dan Suastra, (2014). Pengaruh Model Pembelajaran Perubahan Konseptual Terhadap Pemahaman Konsep Siswa Ditinjau Dari Gaya Kognitif. e-journal Program Pascasarjana Universitas Pendidikan Ganesha, 4(2), 1-12. https://ejournal-pasca.undiksha.ac.id/index.php/jurnal_ipa/article/view/1058

Fathurrohman, M. (2015). Model-Model Pembelajaran Inovatf. Jogjakarta: Ar-Ruzz Media.

Fathurrohman, Muhammad. (2015). *Model-model Pembelajaran Inovatif*. Yogyakarta: Ar-ruzz Media.

Fuadi, R., Johar, R., dan Munzir, S. (2016). Peningkatan Kemampuan Pemahaman dan Penalaran Matematis melalui Pendekatan Kontekstual. Jurnal Didaktik Matematika, 3 (1), 47-54.

Hamdayama, J. (2014). *Model dan Metode Pembelajaran Kreatif dan Berkarakter*. Bogor: Ghalia Indonesia.

Isjoni. (2019). *Cooperative Learning*. Bandung: Alfabeta.

Istarani. (2014). *Model Pembelajaran Inovatif.* Medan: Media Persada.

Jumaisyaroh, T., Napitupulu, E.E., dan Hasratuddin. (2014). Peningkatan Kemampuan Berpikir Kritis Matematika dan Kemandirian Belajar Siswa SMP melalui Pembelajaran Berbasis Masalah. Jurnal Kreano, 5(2), 157-169.

Lohmay, I. (2015). Penerapan Model Pembelajaran ROPES dan Pembelajaran Berbasis Masalah Dalam Konseling Kelompok Terhadap Peningkatan Kemampuan Memecahkan Masalah. Seminar Nasional Teknologi Pendidikan UM 2015. http://digilib.mercubuana.ac.id

Majid, A. (2017). *Strategi Pembelajaran*. Bandung: PT. Remaja Rosdakarya.

Minarni, A., Delina, S. dan Annajmi. (2014). Kemampuan Berpikir Matematis Dan Aspek Afektif Siswa. Medan: Harapan Cerdas Publisher.

Munasiah, Solihah, A. dan Heriyati. (2020). Pemahaman Konsep Dan Penalaran Matematika Siswa Dalam Pembelajaran Matriks. Susunan Artikel Pendidikan, 5(2), 73-78.

Prasetyo, H. (2020). Kemampuan Matematika Siswa Indonesia Berdasarkan TIMSS. Jurnal Padegogik, 3(2), 111-117.

Prihatini, D. dan Setiawan, W. (2020). Analisis Kesalahan Siswa SMP Kelas IX Dalam Menyelesaikan Soal Pada Materi Pokok Bangun Ruang Sisi Datar. Jurnal MAJU, 7(1), 63-69.

Rusman. (2018). *Model – Model Pembelajaran: Mengembangkan Profesionalisme Guru*. Jakarta: PT. Raja Grafindo Persada.

Suherti, Euis & Rohimah, Siti Maryam. (2016). *Bahan Ajar Mata Kuliah Pembelajaran Terpadu*. Bandung: Universitas Pasundan.

Suprihatin, Siti. (2017). *Pengaruh Model Pembelajaran Jigsaw Terhadap Hasil Belajar Studi Masyarakat Indonesia Mahasiswa*. 5(1

Syaripah. (2017). Penerapan Pembelajaran Kooperatif Tipe Jigsaw Dalam Upaya Meningkatkan Pengelolaan Pembelajaran Dan Aktivitas Siswa Kelas V MIS Guppi No. 13 Tasik Malaya Curup utara. Ar-Riayah: Jurnal Pendidikan Dasar, 1(1), 65-86.

Yamin, Martinis. (2013). *Strategi dan Metode dalam Model Pembelajaran*. Jakarta: GP Press Grup.