The Influence of Jigsaw and Mind Mapping Type of Learning Models on Natural Science Outcomes in Elementary School

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Abstract

The results of the study are: 1) There is an effect of the jigsaw type learning model on the Science Learning Outcomes of Class VI in Elementary Schools, this is based on the paired samples test value obtained Sig. (2-tailed) of 0.000 <0.05, or t-count 9.633 > t-table 2.04841, 2) There is an effect of the mind mapping type model on the Science Learning Outcomes of Class VI in Elementary Schools, this is based on the results of the paired samples test obtained the value of Sig. (2-tailed) of 0.000 < 0.05, or t-count 20,602 > t-table 2,05954, 3) There is a difference in the effect of the jigsaw and mind mapping learning models on science learning outcomes for Grade VI in elementary schools. Experiment 1 using the jigsaw learning model got a mean value of 80.44 and experiment 2 using the mind mapping model got a mean value of 90.37. Thus, the influence of the mind mapping learning model is better than the jigsaw learning model.

Keywords: Influence, jigsaw, mind mapping, natural science, learning outcomes, elementary school

INTRODUCTION

Education is an aspect of life that is very basic for the development of a country. Education plays an important role in developing and improving the quality of human resources. In improving the quality of human resources, various efforts have been made by the government, starting from training to improve the quality of teachers, improving the curriculum, and providing facilities and infrastructure that can support the quality of education. This is so that the learning process in schools can run optimally (Arkorful & Abaidoo, 2015). The learning process in schools can run optimally if the implementation of education in schools involves teachers and students, in the form of teaching and learning interactions. In providing education in schools, teachers must plan learning activities systematically and based on the applicable curriculum. Systematic planning and guided by the curriculum will determine success in achieving learning objectives.

Gradually the curriculum underwent improvements aimed at improving the quality of education that was oriented towards the advancement of the national education system (Alsubaie, 2016). However, the improvement of the curriculum is not balanced with the implementation of the curriculum in schools in the form of a learning process. Based on real observations in the field, there are still many learning processes in schools that do not involve students, so students are less creative. There are still many teachers who use the lecture method where the teacher as an information center explains the material and students sit quietly listening and taking notes on the material presented by the teacher, so that students become passive and not creative.

In learning at school students are expected to experience changes both in the fields of knowledge, attitudes and skills. So that using the lecture method will not be able to achieve the expected changes in students. These changes can be achieved if supported by various factors. One of them requires creative teachers who can make learning more interesting and liked by students. Teachers must be creative in planning learning so that students become active and creative, so that students are directly involved in learning. By involving students directly, students' understanding of learning will be maximized. With maximum understanding, the learning objectives will be more easily achieved. One of the subjects contained in the curriculum is science subjects.

Part of learning science material that is considered difficult by students is the solar system. The contributing factors are the teacher's teaching style that is not appropriate, students' negative views on the material (Atilla, 2012), students' learning styles using rote, complicated material characteristics, and students' views that consider the endocrine system as a separate system so that it is difficult to connect with other systems (Tekkaya et al, 2011).

Cooperative learning is one of many student-centered learning approaches. Cooperative learning is learning that demands cooperation, complements each other and can solve problems. Through cooperative learning strategies, students not only learn and accept what is presented by the teacher in learning, but can learn from other students, and at the same time have the opportunity to teach other students.

Arka (2020) states that cooperative learning is a learning model in which the learning system and work in small groups of 4-6 people collaboratively can stimulate students to be more passionate about learning. Hanik (2015) describes several cooperative learning methods, including: Teams Games Tournament (TGT), Group Investigation (GI), jigsaw, Student Teams Achievement Divisions (STAD) and a structural approach that includes Think Pair Share (TPS) and Number Hend Together (NHT).

One of the good cooperative models to be applied in science subjects is the Jigsaw type cooperative model, this Jigsaw type learning model is a cooperative learning model in which students learn in small groups consisting of 4-5 people with attention to heterogeneity, positive cooperation and each member responsible for studying certain problems from the material provided and conveying the material to other group members. Gillies (2016) Jigsaw cooperative learning model is very appropriate to use if the material to be studied is in the form of a written narrative. In line with Gillies's opinion, Julianti in Isjoni (2014) suggests that cooperative learning is more appropriate to use in science learning. So this method is very suitable if applied in the subjects of Natural Sciences. Even the discussions contained in the jigsaw learning model allow students to transfer knowledge to each other. The results showed that the jigsaw learning model was able to significantly improve learning outcomes (Fadliyani et al., 2018). The basic principle of cooperative learning is that students form small groups and teach each other to achieve common goals, even in this learning students are good at teaching students who are less intelligent without feeling disadvantaged (Syarifuddin, 2011). One type of cooperative learning model that can be used to overcome this problem is the jigsaw cooperative learning model.

In addition to using the jigsaw learning model to improve science learning outcomes, solar system material can also be supported by mind mapping learning media (mind maps). The use of mind maps will be able to improve student learning outcomes because the mind map media made by students are built based on students' thinking flow (Slamet et al., 2021). This will give results in the form of a mind map that is different between each student. In addition to being able to improve students' thinking skills, Wycoft in Listyawati et al. (2013) the advantages of the mind map itself include, a) seeing the "overall" picture, b) remembering well, c) being more creative, d) easy to make details plans, e) facilitates communication, f) saves time, g) solves problems, h) is easy to concentrate, and i) organizes and clears the mind. Learning by applying the mind map method can improve students' memory of the material which is marked by the average value of students' cognitive learning outcomes who reach the Minimum Completeness Criteria (Fauzia & Purwantoyo, 2015). Meanwhile, according to Buzan in Darusman (2014) states that Mind Mapping is "the easiest way to enter information into the brain and to retrieve information from the brain. This method is the most creative and effective way of taking notes, so it can be said that mind mapping really maps the minds of the person who made it.

Part of the regulatory system material that is considered difficult by students is in learning science. The contributing factors are the teacher's inappropriate teaching style, students' negative views of the material (Atilla, 2012), students' learning styles using rote learning, complicated material characteristics, and students' views that consider the endocrine system as a separate system so that it is difficult to connect with the system others (Tekkaya et al., 2001). Seeing these problems, an effort is needed that can motivate students and make it easier for students to understand the material on the endocrine system, one of which is by applying a jigsaw type cooperative learning model with mind maps.

Many studies have succeeded in conducting research on the jigsaw type cooperative learning model, including research conducted by Ifa (2013) which states that the application of the jigsaw type cooperative learning model can improve student learning outcomes in class X vocational high school 3 Boyolangu. Research from Trisianawati et al. (2016) which revealed that the jigsaw type cooperative learning model based on macromedia flash can improve student learning outcomes on Newton's law material. Nurhaeni (2011) states that students' understanding of the concept of electricity through jigsaw cooperative learning has increased.

Based on the problems found in the science learning process, there needs to be an improvement in the learning process so that student learning outcomes in science subjects are better. Improvement efforts that can be made include using a jigsaw type cooperative learning model and mind mapping. Through the use of the jigsaw type of cooperative learning model and mind mapping it is expected to increase the achievement of more optimal science learning outcomes (Amin et al., 2021).

The Jigsaw learning model is a learning model that can foster student activity during learning. In this model, students get the opportunity to share ideas with each other and consider the right answer (Saputra et al., 2019). While the mind mapping learning model is different from other learning models because it emphasizes the development of students' minds and memories about the material by taking creative notes, which requires a broad imagination.

Both Jigsaw learning models and mind mapping can improve student learning outcomes. However, from the two learning models, are there differences in learning outcomes between students who apply the Jigsaw learning model and students who apply the Mind mapping learning model to the solar system material (Fatmawati, 2019).

METHODOLOGY

This study uses an experimental method with a quasi-experimental or quasi-experimental type consisting of two research groups, namely the experimental class learning with jigsaw learning models and mind mapping, while the control class is learning as usual with conventional learning models (Maciejewski, 2020). The research design used in this study is the pre-test and post-test control group design. In this design, the experimental group received treatment and received pretest before treatment and posttest after treatment. Experimental group and control class did not receive treatment but received pretest and posttest.

The population in this study was class VI of the State Elementary School 1 Babaktulung, the State Elementary School of Sampung and the State Elementary School of Banowan Rembang. The sample in this study amounted to 87 students consisting of 30 grade VI students at State Elementary School 1 Babaktulang, 30 grade VI students at Sampung State Elementary School and 27 grade VI students at Benawon State Elementary School..

Data collection techniques in this study consisted of, tests, questionnaires and documentation. The test technique in this study was used to determine student learning outcomes in science subjects. The test was conducted by giving pretest and post-test to the experimental and control groups (Namey et al., 2021). Documentation is used to strengthen the data obtained and is also used as authentic evidence that the researcher has actually carried out the research, while the questionnaire is used to determine student responses to the learning model. Analysis of the data in this study through validity test, reliability test, normality test, homogeneity test, average similarity test, paired sample T test and gain index calculation.

RESULTS AND DISCUSSION

Descriptive Analysis

The statistical descriptive of the experimental class 1 pretest in class VI at the State Elementary School Sampung, Sarang District, Rembang Regency, got a minimum score of 40.00, a maximum score of 86.67 and a mean or average of 62.66. in the posttest using the jigsaw learning model, experimental class 1 has an average of 80.44, a minimum value of 60 and a maximum value of 100

The statistical descriptive of the experimental class 2 pretest in class VI at the Banowan State Elementary School, Sarang District, Rembang Regency, got a minimum score of 46.67 while the maximum score was 66.67 and the mean or average was 60.74. in the posttest using the mind mapping learning model, experimental class 2 has an average of 90.37, a minimum value of 80 and a maximum value of 100.

The statistical descriptive of the pretest control class in the sixth grade at the State Elementary School 1 Babktulung, Sarang District, Rembang Regency, got a minimum score of 53.33 while the maximum score was 66.67 and the mean or average was 61.11. in the posttest with lecture learning the control class has an average of 70.89, a minimum value of 60 and a maximum value of 80.

Data analysis

Reliability means that it is a tool for measuring the consistency of the measurement results from a test in measuring what is to be measured (Taherdoost, 2016). Reliability is a calculation carried out to determine the accuracy and level of confidence of the instrument used.

Table 1. Instrument reliability test results

Cronbach's Alpha	N of Items
.845	15

Based on Table 1, it is known that the instrument test consists of 15 test items. The Cronbach Alpha reliability coefficient value obtained is 0.845> R-table (0.444) meaning that the test questions consist of 15 reliable or consistent items. The magnitude of the correlation value is in the high category, meaning that the test instrument for the solar system material test is in the high category.

Validity shows the extent to which the accuracy and precision of a measuring instrument in carrying out its measuring function (Kitagawa, 2015). A measuring instrument is said to be valid and reliable if the measuring instrument shows the validity or validity of an instrument.

Table 2. Test results validity test questions

No. Question	R-Tablr	R-Calculate and Decision	
		R-Calculate	Decision
1	0.444	0,689	Valid
2	0.444	0,738	Valid
3	0.444	0,738	Valid
4	0.444	0,586	Valid
5	0.444	0,527	Valid
6	0.444	0,527	Valid
7	0.444	0,468	Valid
8	0.444	0,640	Valid
9	0.444	0,468	Valid
10	0.444	0,492	Valid
11	0.444	0,468	Valid
12	0.444	0,571	Valid
13	0.444	0,492	Valid
14	0.444	0,527	Valid
15	0.444	0,468	Valid

Based on table 2 of the validity test above, it can be concluded that all the 15 test questions given to students are valid.

Normality test is used to determine whether the data to be analyzed is normally distributed or not. The results of the normality test of the data on science learning outcomes for the solar system material in the table above, it appears that the significance level is 5% or 0.05. The significance value is greater than 0.05 at the 5% significance level so that the null hypothesis (H0) for each class is accepted. Thus it is concluded that the data in each class is normally distributed. The assumption of normality is necessary because if the normality is not met, the decision to test the hypothesis (t-test) obtained is invalid.

The test results on the students' solar system material were then seen for homogeneity. Based on the results of the SPSS output, it is known that the result of the significance value (sig) based on the mean is 0.321 >0.05 at the 5% level, so it can be concluded that the data variance in the control and experimental classes is the same or homogeneous.

The average similarity test was carried out to find out whether the two sample classes departed from the same average condition or not. The results of the analysis of the average similarity test data on the value of students' science learning outcomes on the solar system material before learning in the experimental class 1 and experiment 2 using One-Way Anova in the table above, obtained a significance value of 0.611 >0.05, so it can be concluded that the experimental and control classes have the same average value or the initial ability of the experimental class students is not better than the control class. Analysis of the average similarity test data on the value of students' science learning outcomes on the solar system material after learning in the experimental class and control class using One-Way Anova, obtained a significance value of 0.000 <0.05, so it can be concluded that the experimental class and controls have unequal or significantly different mean.

Hypothesis Test 1

The first hypothesis proposed in this study is "there is an effect of jigsaw learning on learning outcomes in Science Class VI Solar System Materials in Elementary Schools, Sarang District, Rembang Regency.

Table 3. Paired sample t-test experiment class 1 (Jigsaw learning)

Paired Samples Test								
	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pretest -Posttest Experiment 1 (Jigsaw)	17.77800	10.10833	1.84552	21.55251	14.00349	9.633	29	.000

The results of the analysis using paired-samples t-test data on the value of science learning outcomes for grade VI solar system materials at the State Elementary School of Sampung, Sarang District, Rembang Regency. The results of the paired samples test above obtained the value of Sig. (2-tailed) of 0.000 <0.05, or t-count 9.633 > t-table 2.04841. These results mean that there is a difference in the average student learning outcomes for the pre-test and post-test experimental class 1. Thus, it can be concluded that there is an effect of the jigsaw learning model on the science learning outcomes of the solar system material class VI, State Elementary School of Sampung. Sarang District, Rembang Regency. The large influence of the jigsaw learning model on the science learning outcomes of the sixth- grade solar system material at the State Elementary School of Sampung, Sarang District, Rembang Regency is 17.78.

The N-Gain value shows that the increase in learning outcomes of experimental class 1 students by using the jigsaw learning model based on the calculation of the gain index which is included in the high category is 8 (26.7%) students, which includes the category of increasing medium learning outcomes as many as 18 (60%) students and which are included in the category of experiencing an increase in low learning outcomes as many as 4 (13.3%) students. Most N-gain

values are in the medium category. These results can be concluded that the increase in science learning outcomes for grade VI students in the solar system material using the jigsaw learning model at Sampung State Elementary School, Sarang District, Rembang Regency has a moderate increase.

Hypothesis Test 2

The second hypothesis is that there is an effect of mind mapping learning on the learning outcomes of Science in Class VI Solar System Materials in Elementary Schools, Sarang District, Rembang Regency.

Table 4. Paired sample t-test experiment 2 (Mind Mapping learning)

Paired Samples Test								
	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pretest - Posttest Experiment 2 (Mind Mapping)	29.62815	7.47280	1.43814	32.58429	26.67201	20.602	26	.000

The results of the paired samples test above obtained the value of Sig. (2-tailed) of 0.000 < 0.05, or tcount 20,602 > t-table 2,05954. These results mean that there is a difference in the average student learning outcomes for the pre-test and post-test experimental class 2. Thus, it can be concluded that there is an influence of the mind mapping learning model on the science learning outcomes of the solar system material class VI State Elementary School. Banowan, Sarang District, Rembang Regency. The magnitude of the influence of the mind mapping learning model on the science learning outcomes of the solar system material class VI Sampung State Elementary School, Sarang District, Rembang Regency is 29.63.

Based on the results of N-Gain that the increase in learning outcomes of students in the experimental class 2 by using a mind mapping learning model based on the calculation of the gain index which is included in the high category as many as 21 (77.8%) students, which includes the category of increasing medium learning outcomes as many as 6 (22, 2%) students and there are no (0%) students who are included in the category of experiencing an increase in low learning outcomes. Most N-gain values are in the high category. These results can be concluded that the increase in science learning outcomes for grade VI students in the solar system material using the mind mapping learning model at the Banowan State Elementary School, Sarang District, Rembang Regency experienced a high increase.

Hypothesis Test 3

The third hypothesis is that there is a difference in the effect of the jigsaw learning model at the Sampung Sarang Rembang State Elementary School and the mind mapping learning model at the Banowan Sarang Rembang State Elementary School on the fifth grade science learning outcomes in the Solar System material.

Table 5. Paired samples statistics

Paired Samples Statistics				
	Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Pretest Experiment 1 (Jigsaw)	62.6667	30	10.87709	1.98588
Posttest Experiment 1 (Jigsaw)	80.4447	30	9.41805	1.71949
Pretest Experiment 2 (Mind Mapping)	60.7415	27	6.22691	1.19837
Posttest Ecperiment 2 (Mind Mapping)	90.3696	27	6.99927	1.34701

The results of the paired samples statistic test showed that the mean posttest experimental class 1 using the jigsaw learning model at the Sampung State Elementary School, Sarang District, Rembang Regency was 80.44 while the posttest mean value in the experimental class 2 using the mind mapping learning model at the Banowan State Elementary School. Sarang Subdistrict, Rembang Regency is 90.37. These results can be interpreted that the value of the science learning outcomes of the solar system material in the experimental class 2 using the mind mapping learning model is higher than the experimental class 1 using the jigsaw learning model.

So it can be concluded that there is a difference in the effect of the jigsaw learning model and mind mapping on improving science learning outcomes for the sixth grade solar system material at the Elementary School, Sarang District, Rembang Regency and it is known that the experimental class 2 using the mind mapping learning model experienced higher learning outcomes. higher than the experimental class 1 which uses the jigsaw learning model.

DISCUSSION

Experimental class 1 using the Jigsaw learning model was held on 3-5 January 2022 at the Sampung State Elementary School, Sarang District, Rembang Regency with three meetings, namely the first meeting giving a pretest to determine the students' initial abilities, then the second meeting for the treatment of the jigsaw learning model and meeting The third is for the posttest of the science learning outcomes of the solar system material. The instrument is in the form of a multiple choice test that measures the ability of class VI students in the science subject of the solar system material which is adjusted to the achievement indicators.

Based on the explanation and research results, it is known that the Jigsaw learning model in experimental class 1 which is carried out in class VI of the Sampung State Elementary School, Sarang District, Rembang Regency is in the good category. This shows that the stages or syntax of the jigsaw learning model starting from the preliminary activities, core activities and closing have really been carried out properly as an effort to provide treatment to improve students' science learning outcomes. Based on the results of the paired samples test, that there is an effect of the jigsaw learning model on the science learning outcomes of the sixth grade solar system material at the Sampung State Elementary School, Sarang District, Rembang Regency. The improvement of science learning outcomes for grade VI students on the material of the solar system using the jigsaw learning model at the State Elementary School of Sampung, Sarang District, Rembang Regency experienced a moderate increase, thus there was an influence of the jigsaw learning model on learning outcomes.

The results of this study are in line with the research of Jessica et al. (2014) that there is an effect of the jigsaw type cooperative learning model on the science learning outcomes of Class VI students of State Elementary School 6 Dauh Waru Negara. Likewise with the research of Widiana et al. (2015) the results showed that there was a significant difference indicating that the application of the Jigsaw 1 Cooperative learning model and concrete media had a more positive effect on students' science learning outcomes compared to the learning model. conventional.

The results of this study indicate that the theory that jigsaw is a type of cooperative learning that encourages students to be active and help each other in mastering the material to achieve maximum achievement. In its application students are formed in groups, each group consists of a team of experts according to the questions prepared by the teacher, a maximum of five questions according to the number of expert teams (Ifa, 2013).The jigsaw model of cooperative learning is a cooperative learning model that focuses on student group work in the form of small groups, as stated by Johnson & Johnson (2018), that this jigsaw model of cooperative learning is a cooperative learning model where students learn in small groups that consists of four to six people heterogeneously and students work together in a positive and responsible interdependence independently. In this jigsaw learning model students have many opportunities to express opinions, and manage the information obtained and can improve communication skills, group members are responsible for the success of the group and the completeness of the material being studied, and can convey to the group (Beaten & Simon, 2014).

Experimental class 2 using the mind mapping learning model was held on January 6-8, 2022 at the Banowan State Elementary School, Sarang District, Rembang Regency with three meetings, the first meeting giving a pretest to determine the students' initial abilities, then the second meeting for the treatment of the mind mapping learning model. and the third meeting for posttest learning outcomes of science material solar system. The instrument is in the form of a multiple choice test that measures the ability of grade VI students in the science subject of the solar system material which is adjusted to the achievement indicators.

The implementation of the mind mapping learning model in the experimental class 2 which was carried out in class VI of the Banowan State Elementary School, Sarang District, Rembang Regency was in the good category. This shows that the stages or syntax of the mind mapping learning model starting from the preliminary activities, core activities and closing have really been carried out properly as an effort to provide treatment to improve students' science learning outcomes. Based on the results of the paired samples test that there is a difference in the average student learning outcomes for the pre-test and post-test experimental class 2. Thus, it can be concluded that there is an effect of mind mapping learning model on science learning outcomes for class VI solar system material. Banowan State Elementary School, Sarang District, Rembang Regency. Based on the results of the N-Gain Test, it is known that the increase in science learning outcomes for grade VI students in the solar system material by using the mind mapping learning model at the Banowan State Elementary School, Sarang District, Rembang Regency has experienced a high increase, thus it can be concluded that there is an influence of the learning model. mind mapping on student learning outcomes.

The results of the study are relevant to the research of Nopiyanto et al. (2021) that there is a significant difference in social studies learning outcomes between groups of students who study using a jigsaw type cooperative learning model with the aid of mind mapping (mind maps) and groups of students who learn using conventional class V learning. Even Semester of Elementary School in Cluster I, Buleleng District, Buleleng Regency, 2014/2015 Academic Year. This is obtained from the results of the t-test calculation, thit is 5.69, meanwhile, t-tab (with db=47 and a significance level of 5%) is 2.021. This means that t-hit is greater than t-tab (t-hit > t-tab), so H0 is rejected and H1 is accepted. From the average (X), it is known that (X) the experimental group is 22.34 and (X) the control group is 17.13. This means that (X) experiment > (X) control. Thus, the jigsaw type cooperative learning model assisted by mind mapping has an effect on students' social studies learning outcomes.

Also, in line with the research results of Rosyidah (2015) Application of Jigsaw Type Cooperative Learning with Mind Mapping Techniques to Improve Social Studies Activities and Learning Outcomes in Class VIA Krecek State Elementary School 1, Badas District, Kediri Regency. The results showed that the student's activity in learning cycle I reached an average of 77.00 with a completeness percentage of 56%, increasing in cycle II the average to 98.87 with a 100% completeness percentage. student learning outcomes showed that in cycle i the average student was 67.00 with the percentage of classical completeness reaching 40% or 10 students completed and 15 students did not complete increased in cycle ii with an average of 77.88 students classical completeness percentage reached 88% or 22 students completed and 3 students did not complete in learning.

Mind mapping is a way of developing thinking activities in all directions, capturing various thoughts from various angles. Mind mapping develops divergent thinking and creative thinking. Mind mapping which we often call concept maps is a very powerful organizational thinking tool which is also the easiest way to put information into the brain and retrieve that information when needed (Tony Buzan, 2018:4). According to Tony Buzan (2016), Mind maps can help us for many things such as: planning, communicating, being more creative, solving problems, focusing attention, organizing and explaining thoughts, remembering well, learning faster and more efficiently and practicing drawing (Triyanti et al., 2021). whole. In terms of time Mind mapping can also make efficient use of time in studying information. This is mainly because this method can provide a comprehensive picture of a matter, in a shorter time. In other words, Mind mapping is able to cut learning time by changing time-consuming linear note-taking patterns into effective notes that can be directly understood by individuals (Astawa, 2019).

Then also the results of the study show that there is a difference in the effect of the jigsaw learning model at the Sampung Sarang Rembang State Elementary School and the mind mapping

learning model at the Banowan Sarang Rembang State Elementary School on the fifth-grade science learning outcomes in the Solar System material. Another difference in influence can also be seen from the results of the calculation of the gain index for increasing science learning outcomes for the solar system material in the experimental class 1 using jigsaw learning that the N-gain value is mostly in the medium category. While the calculation of the gain index for increasing science learning outcomes for the solar system material experimental class 2 using mind mapping learning that the N-gain value is mostly in the high category. So it can be concluded that there is a difference in the effect of the jigsaw learning model and mind mapping on improving science learning outcomes for the sixth grade solar system material at the Elementary School, Sarang District, Rembang Regency and it is known that the experimental class 2 using the mind mapping learning model experienced higher learning outcomes. higher than the experimental class 1 which uses the jigsaw learning model.

Improving learning outcomes by using the jigsaw learning model is indeed in line with the characteristics of the learning outcomes themselves that learning outcomes are the result of an interaction of act of learning and act of teaching (Stanczak et al., 2022). One of the learning outcomes is cognitive learning outcomes. The results of this study are learning outcomes seen from intellectual abilities related to knowledge. In line with Shi et al. (2020) says that cognitive learning outcomes are a description of the level of mastery of students on the subjects they take or mastery of students on something in learning activities in the form of knowledge or theory that involves knowledge and development, skills intellectual property which includes recall or acknowledgment of facts, procedural patterns, and concepts in the development of students' intellectual abilities and skills. This means that cognitive learning outcomes can be improved with a jigsaw model that involves the active participation of students.

Jigsaw cooperative learning is one of the types of cooperative learning that encourages students to be active and help each other in mastering the subject matter to achieve maximum achievement (Sudrajat et al., 2018). Meanwhile, according to Halim & Syahrun (2020) jigsaw is a cooperative learning model designed to increase students' sense of responsibility towards their own learning and also the learning of others from this opinion it can be concluded that this jigsaw type cooperative learning model is a learning model that focuses on students to work together in groups so that learning achievement is achieved. You & Son (2016) stated that the jigsaw type of learning model has the following characteristics that: a) students work in groups cooperatively to complete the learning material, b) groups are formed from students who have high, medium and low abilities, c) whenever possible, group members come from different races, cultures, ethnicities, genders, d) rewards are more oriented to groups than to individuals.

The results of this study are also in line with Fadliyani et al. (2014) that "this jigsaw learning model is able to significantly improve student learning outcomes, students are also more active, can work well in groups, and have a passion for learning. Compared with students who are taught with conventional learning. Meanwhile, according to Isjoni (2014) this jigsaw type of learning even though the teacher still controls the rules, he is no longer the center of class activities, but the students are the center of class activities" from the above opinion it can be concluded that the jigsaw type of learning model is a learning model that can be used in the learning process and students can be active in it compared to teachers who are the center of learning such as conventional models.

CONCLUSION

There is an effect of the jigsaw learning model on the Science Learning Outcomes of Class VI Solar System Materials at the Elementary School, Sarang District, Rembang Regency, this is based on the paired samples test value above, the Sig value is obtained. (2-tailed) of 0.000 <0.05, or tcount 9.633 > t-table 2.04841. There is an influence of the mind mapping type model on the Science Learning Outcomes of Class VI Solar System Materials at the Elementary School, Sarang District, Rembang Regency, this is based on the results of the paired samples test above, the Sig value is obtained. (2-tailed) of 0.000 <0.05, or tcount 20,602 > t-table 2,05954. There is a difference in the effect of the jigsaw learning model and mind mapping on the science learning outcomes of Class VI Solar System Materials in Elementary Schools, Sarang District, Rembang Regency. Experiment 1 using the jigsaw

learning model got a mean value of 80.44 and experiment 2 using the mind mapping model got a mean value of 90.37. Thus the influence of the mind mapping learning model is better than the jigsaw learning model..

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