The Influence of Jigsaw-type Cooperative Learning Model on Students' Mathematics Learning Outcomes and Motivation

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The learning process is inseparable from the learning model. The application of a learning model is an attempt to improve learning outcomes and learning motivation. This research aimed to determine the effect of the Jigsaw-type cooperative learning model on students' motivation and learning outcomes. This research was a quasi-experimental research with a non-equivalent control group design. The research instruments used were learning motivation questionnaires and tests. Data analysis techniques used were descriptive analysis and inferential analysis using the MANOVA test. The results showed that there was an influence of the Jigsaw-type cooperative learning model on students' motivation and learning outcomes.

INTRODUCTION

Education is a conscious effort to achieve certain goals. A good education helps students to achieve the desired goals (Rosmaiyadi et al., 2018). The National Education System Law Number 20 of 2003 states that education is a conscious and planned effort to create an atmosphere of learning and the learning process so that students can actively develop their potential to have religious and spiritual strength, self-control, personality, intelligence, noble character, as well as the skills needed by himself, society, and the state (Suhana, 2014). One of the indicators of successful learning is the ability to attract students' attention. The learning activity is related to the process and effort did by teachers in delivering the learning materials to students through the material organization in the classroom (Irham & Wiyani, 2013).

One of the learning materials in education is mathematics. Many students consider mathematics to be the most difficult learning material (Puspita & Amalia, 2020). Students are less interested in mathematics (Prawiyogi et al., 2020). Those who think that mathematics is difficult will eventually understand it. It
means that the action depends on the mind (Aslamiah & Suparman, 2019). According to one of the mathematics teachers at MTs Ganrang Batu, students’ learning motivation was lacking so that many students dislike mathematics and considered it difficult. Learning motivation is necessary for the learning process. It takes a variety of alternatives to generate students’ motivation, including the application of learning models. According to Berlyana and Purwaningsih (2019), learning motivation can foster enthusiasm in learning so that students can be encouraged to carry out learning activities (Berlyana & Purwaningsih, 2019). With motivation in the learning process, students will try to do any task and achieve the learning objectives (Sitohang et al., 2017). With learning motivation, students will be prepared to participate in learning activities. This is why the learning motivation variable was one of the data to be discovered in this research.

It is necessary to apply a learning model that can involve students actively in the learning process because the learning model used by the teacher greatly affects the learning outcomes that will be achieved by students (Akhmad, 2018). According to Janah and Subroto, cooperative learning is one of the teaching strategies designed to educate students to work together and interact within a group (Janah, I. & Subroto, 2018). Cooperative learning is focused on motivating students to take an active role in interacting with other students in groups.

One of the cooperative learning models that can be used in problem-solving is the Jigsaw model. The Jigsaw model can support the development of students’ problem-solving ability because they must learn within more specific small groups (Buhr et al., 2014). The Jigsaw-type cooperative learning model is slightly different from other cooperative learning models. According to Subiyantari, Muslim, and Rahmadyanti, students are grouped twice, when they are in their group and when they are in an expert group (Subiyantari et al., 2019). According to Djuli, the Jigsaw-type cooperative learning model contains learning activities that teachers need to provide, namely determining the learning objectives to be achieved, preparing the learning guidelines, forming heterogeneous groups, and presenting (Djuli, 2016). The Jigsaw-type cooperative learning model is one of the learning models that require students to help each other in building and understanding class assignments (Abed et al., 2019).

One of the factors that can affect students’ learning outcomes is learning motivation (Kohar, 2017). The learning motivation is defined as the students’ tendency to perceive academic activities as meaningful and useful so that they try to take the desired academic benefits (Ningsih et al., 2016). According to Supardi (2012), a strong learning motivation will encourage students to try hard and never give up when facing all challenges and obstacles while studying so that in the end, they will produce optimum learning achievement (Supardi, 2012). This is also reinforced by previous research which suggests that students’ ability to understand mathematical concepts will increase by applying the Jigsaw-type cooperative learning model (Ananda et al., 2020; Septian & Ramadhantry, 2020). According to Novitasari and Leonard (2017), there is a significant influence on students’ ability to understand mathematical concepts on their mathematics learning outcomes (Novitasari & Leonard, 2017). According to Sumarsih and Pardimin (2017), the Jigsaw-type cooperative learning model can increase students’ understanding and learning motivation (Sumarsih & Pardimin, 2017). The difference between this research and the previous ones was that this research simultaneously tested
the effect of the Jigsaw-type cooperative learning model on students' motivation and mathematics learning outcomes. Various studies had been conducted on the relationship between learning models, learning outcomes, and learning motivation. The learning motivation which is usually used as the modifier variable in previous studies served as the dependent variable in this research.

METHOD

This research was a quasi-experimental research with the quantitative approach. The research design used was the non-equivalent control group design to determine the initial state and determine the difference between experimental groups I and II. The pretest results are considered good if the experimental class scores are not significantly different. This research was conducted at MTs Ganrang Batu which is located at Ganrang Batu Selatan of Kayuloe Timur Village, Turatea District, Jeneponto Regency. The seventh-grade students of MTs Ganrang Batu in the 2018/2019 academic year were involved in this research. The students were divided into 2 classes, namely class A and class B which consisted of 40 students. The sampling technique used was the saturated sampling technique so that from the 2 classes, one of them was taken as the control class and the other one was taken as the experimental class. The data collection techniques were written tests and questionnaires to determine student motivation and learning outcomes. The indicators of learning motivation were the willingness and desire to succeed, encouragement and need in learning, future hopes and aspirations, appreciation in learning, interesting activities in learning, and a conducive learning environment that allowed students to learn better (Uno, 2016). The data analysis technique in this research was the descriptive analysis and inferential analysis with prerequisite tests, namely the normality test, the homogeneity test, and the hypothesis test using the MANOVA test.

RESULTS AND DISCUSSION

The results indicated that there was a difference in the students’ average learning motivation between the experimental class and the control class. The average learning motivation of the class that applied the Jigsaw-type cooperative learning model (78.05) was higher than the class that did not apply the Jigsaw-type cooperative learning model (51.70). The detailed results can be seen in Table 1.

| Class          | N  | Mean | Std. Deviation |
|----------------|----|------|----------------|
| Experimental   | 20 | 78.05| 8.281          |
| Control        | 20 | 51.70| 5.090          |

The mean difference was in line with the percentage of learning motivation categories between the experimental class and the control class which also different. The learning motivation of students who were taught using the Jigsaw-type cooperative learning model was in the high category while the learning motivation of students who were not taught using the Jigsaw-type cooperative learning model was in a low category. The details of learning motivation categories can be seen in Table 2.
Table 2. The Categories of Learning Motivation in the Experiment Class and the Control Class

| Interval | Categories  | The Learning Motivation of the Experimental Class | The Learning Motivation of the Control Class |
|----------|-------------|--------------------------------------------------|---------------------------------------------|
| 20–36    | Poor        | F 0  P (%) 0                                    | F 0  P (%) 0                                 |
| 37–52    | Low         | 1 5                                              | 13 65                                       |
| 53–68    | Moderate    | 2 10                                             | 7 35                                        |
| 69–84    | High        | 12 60                                            | 0 0                                         |
| 85–100   | Excellent   | 5 35                                             | 0 0                                         |
| Total    |             | 20 100                                           | 20 100                                      |

The results of the descriptive analysis showed that there were differences in the mean scores and the students' learning motivation categories. The class that was taught using the Jigsaw-type cooperative learning model had a high level of learning motivation. The results of the descriptive analysis were in line with the results of the MANOVA test with the p-value of 0.04 <0.05 which indicated that H₀ was rejected. It meant that there was an effect of the Jigsaw-type cooperative learning model on the learning motivation of the seventh-grade students of MTs Ganrang Batu.

The results of the analysis were relevant with the advantages of the Jigsaw-type cooperative learning model which can stimulate students' learning motivation and can make it easier for them to remember an event (Suprihatin, 2017). The Jigsaw-type cooperative learning model can maximize the students' activeness in the learning process by collecting information, discussing, and helping each other in learning mathematical concepts so that their conceptual understanding could be improved (Istihapsari, 2017). The results are also relevant to the research conducted by Wicaksono (2018) that there is an effect of the Jigsaw-type cooperative learning model on students' learning motivation (Wicaksono, 2018).

These results are in line with the research by Asnawi, Ikhsan, and Hajidin (2020), which concluded that there are differences in learning motivation between students who are taught using the Jigsaw-type cooperative learning model and students who are taught using the STAD learning model (Asnawi et al., 2020). According to Utomo (2016), motivation can make students learn by using higher cognitive processes so that they can better absorb and remember the learning material (Utomo, 2016).

Research by Tarigan (2014), concluded that the use of the jigsaw-type cooperative learning model can increase students' learning motivation in mathematics (Tarigan, 2014). I am also in line with the research by Batubara (2018) which states that the jigsaw-type cooperative learning model, students' learning motivation in mathematics increases (Batubara, 2018).

Research by Anggis (2017) concluded that the application of the Jigsaw-type cooperative learning model can increase learning motivation (Anggis, 2017). It is similar to the research by Kesuma and Sukirno (2016) where students' learning motivation increased after implementing the Jigsaw-type cooperative learning model (Kesuma & Sukirno, 2016). Likewise, the research by Susanto, Handayani, Akhlis (2013) concluded that the application of the Jigsaw II cooperative learning model can increase students’ learning motivation (Susanto et al., 2013).
According to Cleopatra (2015), motivation is a factor that stimulates a person in the form of an urge to act and behave (Cleopatra, 2015). Two factors influence a person to be motivated in learning (Anggraini, 2016). The first is the internal factors that come from within a person. Someone will acknowledge the importance of learning that can affect the present and future life so that the motivation will be formed. The second is the external factors that come from outside a person or commonly known as environmental factors. The involvement of other people or the environment can provide a stimulus.

The average mathematics learning outcomes between the experimental class and the control class was different. The average learning outcomes of the experimental class that applied the Jigsaw-type cooperative learning model was 67.35 which was higher than the class that did not apply the Jigsaw-type cooperative learning model (58.05). The detail can be seen in Table 3.

Table 3. The Posttest Learning Outcomes of the Experiment Class and Control Class

| Class        | N  | Mean | Std. Deviation |
|--------------|----|------|----------------|
| Experimental | 20 | 67.35| 19.693         |
| Control      | 20 | 58.05| 15.555         |

The mean difference was in line with the learning outcome percentage of the experimental class that applied the Jigsaw-type cooperative learning model. The detail can be seen in Table 4.

Table 4. The Categories of Mathematics Learning Outcomes of the Experimental Class and Control Class

| Interval | Category | Experimental Class posttest | Control Class posttest |
|----------|----------|----------------------------|------------------------|
|          |          | F  | P (%) | F  | P (%) |
| 0 - 20   | Poor     | 0  | 0     | 0  | 0     |
| 21 - 40  | Low      | 3  | 15    | 2  | 10    |
| 41 - 60  | Moderate | 3  | 15    | 10 | 50    |
| 61 - 80  | High     | 8  | 40    | 7  | 35    |
| 81 - 100 | Excellent| 6  | 30    | 1  | 5     |
| total    |          | 20 | 100   | 20 | 100   |

Table 4 shows that the excellent category of the learning outcome in the experimental class was at 30% while the control class was only at 5%. This showed that the two classes, namely the experimental class and the control class, achieved different results as a result of the treatment carried out by the researcher.

The results of the descriptive analysis were also in line with the MANOVA test with the p-value = 0.0001 <0.05, so Ho was rejected. The results indicated that the Jigsaw-type cooperative learning model influenced the mathematics learning outcomes of the seventh-grade students of MTs Ganrang Batu. The results were reinforced by Gulsen CaGaTay (2013) which discovers that the experimental group students who were taught with the Jigsaw learning obtained much better learning outcomes than the control group students who were taught using the conventional model (Gulsen CaGaTay, 2013).

The results of this research are in line with the research by Andini and Barutu (2019) which states that there was a significant influence of the Jigsaw-type cooperative learning model on students’ learning outcomes (Andini & Barutu, 2019). Likewise, research by Dinar, Asdar, and Saputri (2018) discovers that the mathematics learning outcomes of students who were taught using a Jigsaw-
type cooperative learning model were higher than students who were taught using STAD cooperative learning model (Dinar et al., 2018).

Rosyidah (2016) concludes that the Jigsaw-type cooperative learning model had a positive influence on students’ learning outcomes (Rosyidah, 2016). It is also similar to the research results by Singga (2011) that there is a significant difference in the mathematics learning outcomes between the application of the Jigsaw-type cooperative learning model and the application of the conventional learning model (Singga, 2011).

Basuki (2015) states that the use of the Jigsaw-type cooperative learning model in learning can activate students’ activities and can improve their learning outcomes (Basuki, 2015). A similar result was also found in research by Hia (2013), that after applying the Jigsaw-type cooperative learning model, there was an increase in students’ activity and learning outcomes (Hia, 2013). Nasruddin and Abidin (2017) state that students’ mathematics learning outcomes were improved after implementing the Jigsaw-type cooperative learning model (Nasruddin & Abidin, 2017).

According to Lestari (2015), learning outcomes change after carrying out the learning process. Changes in psychomotor, affective, and cognitive aspects are a form of change as a result of the learning process (Lestari, 2015). In assessing students’ learning outcomes, Subagia and Wiratma (2016) state that it depends on what competencies will be assessed. To assess the students’ attitudes, an assessment can be carried out through observation, self-assessment, and peer assessment (Subagia & Wiratma, 2016). To assess the knowledge, the assessments can be written tests, oral tests, and assignments. Skills competency assessment can be done through performance appraisals such as portfolios, projects, and practical assessments.

According to Slameto in Suwardi (2012), two factors influence a person’s success in the learning process, namely (a) internal factors or often referred to as factors that come from within a person which include physical factors, psychological factors, and student activeness in society; (b) external factors or factors that come from outside a person are usually called environmental factors, including family factors (upbringing from parents, relationships among family members, family economic conditions, understanding of parents and cultural background), school factors (learning methods, tools, materials, media, curriculum, learning standards, the state of the school environment, school facilities and infrastructure, relationships between teachers and students, and the relationships between students and other students (Suwardi, 2012).

The separate test results showed that the Jigsaw-type cooperative learning model influenced students’ learning motivation. Likewise, the Jigsaw-type cooperative learning model influenced students’ learning outcomes. To test both factors, the MANOVA test was carried out. The statistical tests used were the Pillai’s Trace test, Wilks’ Lambda, Hotelling’s Trace, Roy’s Largest Root contained in the Multivariate Test table.

| Effect         | Value | F     | Sig. |
|----------------|-------|-------|------|
| Class          | .079  | 1.595b| .005 |
| Pillai's Trace | .921  | 1.595b| .005 |
| Wilks' Lambda  |       |       |      |
| Hotelling’s Trace | .086 | 1.595b| .005 |
| Roy’s Largest Root | .086 | 1.595b| .005 |

The multivariate test results showed that the p-values for Pillai’s Trace, Wilks Lambda, Hotelling’s Trace, Roy’s Largest Root were 0.005 < 0.05. Since the F values of the Pillai’s Trace, Wilks Lambda,
Hotelling’s Trace, Roy’s Largest Root were all significant, so $H_0$ was rejected. This indicated that there is an influence of the Jigsaw-type cooperative learning model on learning motivation and mathematics learning outcomes.

The results of this research were supported by Yemi, Binti, and Azid (2018) who stated that the learning achievement of the experimental group who were taught using the Jigsaw-type cooperative learning model was better than students who were taught using the lecture method (Yemi et al., 2018). Also, Lasmawan and Sutama (2013), states that there are differences in motivation and learning outcomes between groups of students who are taught using the jigsaw-type cooperative learning model and groups of students who are taught using the conventional learning model (Lasmawan & Sutama, 2013). In other research, Jaya (2016) concludes that there is an influence of the jigsaw-type cooperative learning model on students’ Geography learning outcomes so that this model can be used to improve students’ learning outcomes (Jaya, 2016).

Research by Juwaeriah, Muhyani, and Ikhtiono (2017) conclude that there is a significant influence between motivation and students’ learning outcomes between the Jigsaw-type cooperative learning model and the conventional learning model (Juwaeriah et al., 2017). Sudharmini, Lasmawan, and Natajaya (2014) state that there are differences in students’ learning motivation and learning outcomes between students who were taught using the Jigsaw-type cooperative learning model and students who were taught using the conventional learning model (Sudharmini et al., 2014).

Sumarsih and Pardimin (2017) conclude that there is an increase in students’ learning motivation and students’ learning outcomes after implementing the Jigsaw-type cooperative learning model (Sumarsih & Pardimin, 2017). Likewise, the research by Sulasmi, Lasmawan, and Landrawan (2013) discovers that after implementing the Jigsaw-type cooperative learning model, there was an increase in students’ learning motivation and learning outcomes (Sulasmi et al., 2013). Kesnajaya, Dantes, & Dantes (2015) state that to improve students’ motivation and learning achievement, the application of the Jigsaw-type cooperative learning model is quite effective to be used.

One of the factors that affect learning outcomes is students’ learning motivation. According to Emda (2017), the learning success of students is greatly influenced by the presence or absence of motivation in learning (Emda, 2017). If there are a desire and encouragement to learn, learning success can be achieved. Hamdu and Agustina (2011) state that students who have high learning motivation will also get high learning outcomes because students with high motivation will study harder, more persistent, and more diligent so that it will affect their learning outcomes (Hamdu & Agustina, 2011). Mulyaningsih (2014) states that the students’ learning success is due to the high motivation they possess (Mulyaningsih, 2014). To improve learning outcomes, someone who has high learning motivation will try to be more active, persistent, never give up, and study hard. Therefore, in the learning process, it is necessary to pay attention to the treatment given to students so that learning motivation and learning outcomes can increase. The information as the results of this research provides an overview of the effect of the learning model.

**CONCLUSIONS AND SUGGESTIONS**

It can be concluded that there was a significant effect of the application of the Jigsaw-type cooperative learning model on students’ learning outcomes and motivation.
Future research can develop and retry with different learning models that can better influence students’ learning motivation. The jigsaw learning model can also be investigated whether it can affect students’ abilities in other aspects of ability.

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