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Efektivitas Model Pembelajaran Jigsaw Berbasis Kartu Bernomor: Strategi Peningkatan Motivasi Belajar Matematika Siswa Sekolah Dasar

The Effectiveness of Jigsaw Learning Model by Using Numbered Cards: Strategy for Increasing Mathematics Learning Motivation Students in Elementary School

Muh. Khaerul Ummah BK[1], Hamna[2]
[1,2]Program Studi Pendidikan Guru Sekolah Dasar, Universitas Madako Tolitoli
e-mail: muhkhaerulummahbk27@gmail.com

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Abstract
This study aims to increase the motivation of learning mathematics in elementary school through the implementation of the Jigsaw learning model based on the use of numbered cards as an effective strategy to increasing students' motivation to learn mathematics by involving research samples of 52 students. this study analyzed using a descriptive quantitative approach with Quasi Experiment Nonequivalent Control Group Design. Collecting research data using instruments such as teacher and student observation sheets and questionnaire instruments that have been validated by expert validators. The results of this study indicate that the students' motivation in the experimental class is better than the control class, with evidence that there has been an increase in the learning process which has an impact on increasing students' motivation to learn mathematics consistently from the first meeting to the third meeting with the good assessment categories. the results of this study are that the use of numbered cards makes it easier to organize students' group learning activities through the implementation of the Jigsaw learning model, stimulates the development of students learning concentration, and is even more enthusiastic for students to be actively involved in completing their learning tasks.
Keywords: *Jigsaw Learning; Learning Motivation; Mathematics*

Abstrak
Penelitian ini bertujuan untuk meningkatkan motivasi belajar matematika di SD/MI melalui penerapan model pembelajaran Jigsaw berbasis penggunaan kartu bernomor sebagai strategi efektif dalam meningkatkan motivasi belajar matematika siswa dengan melibatkan sampel penelitian sebanyak 52 orang siswa. Dalam penelitian ini dianalisis dengan menggunakan pendekatan kuantitatif deskriptif parametrik Independent sample t-Test dengan desain penelitian Quasy Experiment Nonequivalent Control Group Design. Pengumpulan data penelitian ini menggunakan lembar observasi guru dan lembar observasi siswa, dan

instrumen angket yang telah diuji tingkat validitas penggunaannya oleh validator ahli. Hasil penelitian ini menunjukkan motivasi siswa pada kelas yang menerapkan model yang diteliti (kelas eksperimen) lebih baik daripada kelas kontrol, dengan pembuktian bahwa telah terjadi peningkatan proses pembelajaran yang berdampak pada peningkatan motivasi belajar matematika siswa yang secara konsisten dari pertemuan pertama sampai pertemuan ketiga dengan kategori penilaian baik. Implikasi dari hasil penelitian ini bahwa pemanfaatan media kartu bernomor lebih memudahkan didalam mengorganisasikan aktivitas belajar kelompok siswa melalui penerapan model pembelajaran Jigsaw, menstimulasi terbangunnya konsentrasi belajar siswa, dan bahkan lebih mengantusiaskan siswa untuk terlibat aktif dalam menyelesaiakan tugas-tugas belajarnya yang merupakan cerminan adanya peningkatan motivasi belajar matematika yang terbangun dalam diri siswa secara efektif.
Kata kunci: *Matematika; Motivasi Belajar; Pembelajaran Jigsaw*

Introduction

The main role of a teacher at every level of education, including in elementary schools, is to help students to be well accommodated for their learning needs. The success of learning activities carried out in each school environment is not seen from the extent to which the teacher has explained the entire teaching material to students completely, but seen from the interest of students to be actively involved in every learning activity in achieving quality learning output (Asnita, 2020). There are so many subjects at the elementary school level that aim to accommodate students' learning needs. However, not all of these subjects will be of interest to students, especially if the learning is difficult for students (Prihatini, 2017).

Learning that is often less attractive to students in elementary schools, one of them is mathematics. Because it is viewed from the student's perspective, mathematics is still seen as a difficult subject to learn (Siregar & Restati, 2017). almost all material clusters in mathematics learning require a high level of reasoning power, so students tend to avoid them (Santoso, 2017) (Saraswati & Agustika, 2020).

Students 'perceptions of learning mathematics like this, of course, will be able to influence students' learning attitudes and behavior. This change in learning attitudes will result in lower student motivation (Hamna & BK, 2020). Therefore, it is not easy to teach mathematical concepts without reinforced intrinsic motivation in students, so an effective learning strategy is needed in building students' motivation to learn mathematics (Siregar & Restati, 2017).

In several learning cases, the low motivation to learn the mathematics of elementary school students often dominates teachers' concerns up to now. Especially if this problem is often triggered by teacher teaching factors that are less attractive to students, so that it will only cause student boredom while learning (Utamajaya et al., 2020). This includes if the teaching process still emphasizes the old paradigm of learning that does not involve students in the process of finding the mathematical concepts they teach (Ulya & Rahayu, 2017).

Based on the problem of low motivation to learn mathematics which is mostly experienced by students in elementary schools, it is considered relevant to the learning phenomenon that occurs in SD Inpres Bontomanai Makassar City, where students' learning achievement, especially in the VA and VB classes, is found to be in a low category. This statement was then strengthened by looking at the accumulative data on student learning outcomes in the 2018/2019 academic years.

According to the results of the accumulated learning achievement scores of students in-class VA and class VB, an average score of 67.03 was found. Of course, this achievement still does not meet the minimum completeness criteria (KKM) set by the teacher with a standard score of 70. However, it is different from learning outcomes in other subjects such as Religious Education (86.89), Local Content (80.22), Education Physical Sports, and Health (87.88), Indonesian Language Education (76.77), Social Studies (83.54) and Science (82.35) are all actually above the standardized KKM score.

The low student achievement in mathematics is presumed to tend to be influenced by low student motivation. In addressing these problems, it can be started by trying to build student learning motivation that describes their interest in learning.

Said to Muhibbin Syah (Herbeng, 2015), many factors can affect the quality and quantity of student learning outcomes such as intelligence, attitudes, talents, interests, and essentially these factors are also influenced by the motivation built into students. As an effort to build student learning motivation, one of them is by applying the Jigsaw learning model which is designed using numbered card media in students' mathematics learning activities.

In a more general explanation, learning with the Jigsaw strategy is a learning strategy first introduced by Aronson in 1978 (Şengül & Katranci, 2014), which emphasizes the learning activities of small groups of students who are named as the home team group and the expert team (Trisdiono & Zuwanti, 2017). Meanwhile, the

function of this numbered card is useful for facilitating the creation of pleasant learning nuances, inviting student learning challenges, and encouraging students to learn (Rochaniningsih & Masruri, 2015).

Related to the choice of the implementation of the Jigsaw learning model, this cannot be separated from several previous studies which are considered relevant. For example, the results of research with the title The Effect of the Jigsaw Cooperative Learning Model on Student Learning Outcomes in Mathematics Subjects (Juwaeriah, et. al, 2017). Another research result entitled The Effect of Jigsaw Cooperative Learning Model on Quadrilateral Material on Learning Motivation and Learning Outcomes of Class VII Students of SMP Negeri 1 Yogyakarta Academic Years 2018/2019 (Nggumbe, 2019).

The similarity of this study with previous research is that it is both concentrated on the implementation of the Jigsaw learning model. But the differences are seen in terms of the implementation of the Jigsaw learning model which is designed using numbered cards with the main objective of increasing students' motivation to learn mathematics.

In connection with the previous explanation, several formulations of research problems were raised, namely:

1. What is the description of the implementation of the Jigsaw learning model based on the application of numbered cards in mathematics learning in elementary school students?
2. What is the description of student motivation in mathematics in elementary school?
3. Is the implementation of the Jigsaw learning model based on the application of numbered cards effective in increasing students' motivation to learn mathematics in elementary schools?

The hypothesis that is built in this study is the implementation of the Jigsaw learning model using numbered cards, which is effective for increasing student motivation to learn mathematics in elementary schools.

Method

This study uses a quantitative approach with a Quasy Experiment research type nonequivalent control group design. What distinguishes it from true experimental design is that the research sample of the two classes (control class and experimental class) is not determined through a randomization process (BK, et. al., 2020).

As with the research design, a research class was formed (control class and experimental class). The number of samples involved in the study amounted to 52 students and then divided into two research classes which were determined purposively and proportionally in which the control class (27 students) and the experimental class (25 students).

To facilitate the control of the research class, observation guidelines for the teacher and student observation sheets were used, as well as a questionnaire instrument. All instruments used have been tested for their validity by an expert validator with information worthy of use.

Table 1 Expert Validator Assessment Results
Related to The Level of Validity of Research Instruments

Research Instruments	Average	Assessment Criteria
Lesson Plan	4,385	Valid
Student Worksheets	4,460	Valid
Teacher Observation Sheets	4,625	Very Valid
Students Observation Sheets	4,443	Valid
Student Motivation Questionnaire	4,385	Valid

The motivation to learn mathematics in this study is measured based on the answers obtained from the results of filling out the research questionnaire which shows the conditions experienced by students with the indicators: (a) there is a desire to be successful in learning, (b) a sense of interest in learning, (c) there is an urge to meet their learning needs, (d) there is hope to be appreciated, and (e) there is a support for a conducive learning environment.

As for answering the questionnaire statement, 4 (four) alternative answer choices were prepared according to the guideline for scaling the answer levels in the form of a Likert Scale, whose answers point to the general situation experienced by the sample when answering the questionnaire statement, such as Highly Motivated, Motivated, Low Motivated and Not Motivated.

Before the teacher carries out the learning activities that will be carried out in the control class and experimental class, the first questionnaire is distributed to all research samples to determine the initial conditions of motivation to learn mathematics. The giving questionnaire I was given outside of the learning meeting schedule and so was the provision of questionnaire II after the implementation of all the learning processes for three meetings.

The feasibility analysis of the learning motivation questionnaire instrument was also strengthened through the results of the Cronbach's Alpha coefficient test of 0.962, so it could be stated that the test instrument used was very reliable. It can also be stated that of the 40 items of the questionnaire statement made, it was found that 8 items of the questionnaire statement were considered invalid because the coefficient value was below 0.30 so that the number of questionnaire items used was 32 items.

Table 2 *Reliability Statistics*

Cronbach's Alpha	*N of Items*
.962	40

The data analysis technique for testing the effectiveness uses statistical descriptive analysis which is measured based on the average value or the trend value of the data. Also, the independent sample t-test statistical inference technique is used to test the effectiveness of the implementation of the model under study on students' motivation to learn mathematics. Regarding the results of the research data normality test for the data on the answers to the mathematics learning motivation questionnaire provided by the research sample, both in the form of Questionnaire I and Questionnaire II are shown in table 3 and table 4 below.

Table 3 Results of Normality Test for Questionnaire I Data
Measurement of Students' Mathematics Learning Motivation

Test of Normality

Learning Motivation Questionnaire		Kolmogorov-Semirnov[a]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Results	The questionnaire I Control Class	.111	27	.200*	.974	27	.713
	The questionnaire I Experiment Class	.116	25	.200*	.964	25	.508

Table 4 Result of Normality Test for Questionnaire II Data
Measurement of Students' Mathematics Learning Motivation

Test of Normality

Learning Motivation Questionnaire		Kolmogorov-Semirnov[a]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Results	Questionnaire II Control Class	.134	27	.200*	.948	27	.193
	Questionnaire II Experiment Class	.148	25	.164	.928	25	.077

According to the results of obtaining output data which shows the results of data normality test, both as seen from the results of Questionnaire I and Questionnaire II filling out the questionnaire measuring students' mathematics learning motivation in the control class and the experimental class can be said to have been normally distributed because the test data obtained test results data. The normality of the data has exceeded the level of significance required in the testing criteria, namely 5% or 0.05 so that from the test results it can be concluded that all data are normally distributed.

The same as the homogeneity test results of the data that have been analyzed through the SPSS 23.0 for Windows program, both the results of the data homogeneity test for Questionnaire I and Questionnaire II filling out a questionnaire measuring students' mathematics learning motivation in the control class and the experimental class are shown in table 5 and table 6 below.

Table 5 Homogeneity Test Results for Questionnaire I Data
Students' Mathematics Learning Motivation in Control Class and Experiment Class

Test of Homogeneity of Variance

Results Questionnaire I	Lavene Statistic	Df1	Df2	Sig.
Based on Mean	.220	1	50	.641
Based on Median	.210	1	50	.649
Based on Median and with Adjusted Df	.210	1	49.769	.649
Based on Trimmed Mean	.218	1	50	.642

Table 6 Homogeneity Test Results for Questionnaire II Data
Students' Mathematics Learning Motivation in Control Class and Experiment Class

Test of Homogeneity of Variance

Results Questionnaire II	Lavene Statistic	Df1	Df2	Sig.
Based on Mean	.020	1	50	.889
Based on Median	.009	1	50	.925
Based on Median and with Adjusted Df	.009	1	48.315	.925
Based on Trimmed Mean	.019	1	50	.892

Based on the data collection Based on Mean in table 5 and table 6, it is known that the results of the data homogeneity test for Questionnaire I data are 0.641 and for Questionnaire II data, the results of filling out the questionnaire are 0.889. From the results of this test, it is known that the standard significance value required in the testing criteria is 5% or 0.05. Thus, the results of this test indicate that the diversity of data from the measurement of students' mathematics learning motivation in the control class and the experimental class is homogeneous.

As the results of the normality and homogeneity of the data indicate that the requirements for testing the parametric research hypothesis are fulfilled by the Independent Sample T-Test. This parametric test analysis is intended to determine the implementation of the Jigsaw learning model which is designed with the use of numbered cards, which can be effective in increasing student learning motivation.

Results

1. Results of The Implementation of Numbered Cards Based Jigsaw Learning Model

The implementation of the numbered cards-based Jigsaw learning model as a learning model that was studied to increase students' motivation to learn mathematics was specifically implemented in the experimental class for three meetings. In connection with the learning activity, it is almost the same as the implementation of the Jigsaw learning model in general, which forms an origin group and an expert group. It's just that in this study, the implementation of learning is synchronized with the use of numbered cards media which is carried out for three learning meetings based on the following eight learning stages.

a. The teacher conveys the objectives of learning mathematics for certain teaching materials and motivates to learn to students.
b. Students are organized into 5 study groups heterogeneously, consisting of 5 students in one group who will later be named as the home team, and then each student in the group is given a numbered card from numbers 1 to 5.
c. Students listen to and observe the teacher's explanation regarding mathematics teaching material.
d. Based on the card number owned by each student, then they are asked to form a new study group (team of experts) in which student members who have the same cards number are joined to work on the quiz together according to the number code on the cards it has.
e. After completing the quiz work with the members in the expert group, then the teacher instructs all students to return to their home team to teach each other the quiz questions they learned when joining the expert team.
f. The teacher allows all students involved in the home team to re-discuss all the quiz questions they have worked on together with the expert team.
g. The teacher invites the original team members whose card numbers are mentioned to solve the quiz questions (mention of cards is done randomly to generate student enthusiasm).
h. The teacher gives awards to members of the student group who appear to work on the quiz, as well as a token of appreciation to all other members of the study group.

As the results of the implementation of learning, data is obtained as shown in table 7. There is an increase in the process of applying this learning model to the experimental class at each meeting, providing descriptive information that the Jigsaw learning model using numbered cards media are effective for increasing students' motivation to learn mathematics.

Table 7 Teacher and Students Observation Data

Learning Meeting	**Teacher Activities**		**Students Activities**	
	(%)	**Categories**	**(%)**	**Categories**
I	76,19 %	Good	80,95 %	Good
II	85,71 %	Good	85,71 %	Good
III	90,48 %	Good	95,24 %	Good
Average	**84,13 %**	**Good**	**87,30 %**	**Good**

The effectiveness of the implementation of this learning, both teacher teaching activities and student learning activities from meeting I to meeting III consistently experience an increase in the learning process with an accumulative average assessment with a good assessment category. This can ensure that if the learning understudy is carried out effectively, it will also influence the increase in expected learning symptoms, such as can affect the increase in students' motivation to learn mathematics.

According to the results of the application of learning using numbered cards, it is known that several learning advantages were found in this study:

a. Using numbered cards makes it easier to organize student study groups in the original and expert groups.
b. Avoid discriminating against the formation of study groups such as the gathering of group members of students who have the same intelligence or vice versa in one study group.
c. Students are increasingly enthusiastic about participating in a series of active learning activities.
d. With the use of numbered cards, all students feel that they will be appointed by the teacher is doing the learning assignments they give.
e. By randomly mentioning the cards while doing assignments, it can help students concentrate on learning.

2. Descriptions of Students' Mathematics Learning Motivation

Based on this research, the description of student learning motivation is measured by filling out a questionnaire instrument that has been filled in by the research sample. The results are tabulated in Table 8 below.

Table 8 Description of Student Motivation
(Results of Filling in Questionnaire I/Initial Motivation)

Nu.	Level Motivation	Experiment Class		Assessment Qualification	Control Class	
		Frequency	(%)		Frequency	(%)
1	32 – 55	1	4 %	Not Motivated	1	3,7 %
2	56 – 79	16	64 %	Low Motivated	16	59,26 %
3	80 – 103	8	32 %	Motivated	10	37,04 %
4	104 – 128	0	0 %	Very Motivated	0	0 %
Amount		**25**	**100 %**		**27**	**100%**

Percentage data above provides information that students' motivation to learn mathematics (experimental and control class) tends to show the same state of learning motivation as the qualification assessment "low motivated". This fact is caused by the dominance of the influence of the implementation of previous learning, outside of the implementation of the Jigsaw learning model based on the use of numbered cards media. Thus, to find out whether the learning model undestudy was effective in increasing student learning motivation, a pairing of students' final motivation was carried out according to the results of filling out questionnaire II, referring to the following table 9.

Table 9 Descriptions of Student Motivation
(Results of Filling in Questionnaire II/Final Motivation)

Nu.	Level Motivation	Experiment Class		Assessment Qualification	Control Class	
		Frequency	(%)		Frequency	(%)
1	32 – 55	0	0 %	Not Motivated	0	0 %
2	56 – 79	0	0 %	Low Motivated	18	66,67 %
3	80 – 103	8	32 %	Motivated	9	33,33 %
4	104 – 128	17	68 %	Very Motivated	0	0 %
Amount		**25**	**100 %**		**27**	**100%**

As the difference between the differences in the results of questionnaire II is shown in table 5 above, for the experimental class the students' learning motivation tended to be in the "highly motivated" category, while the control class tended to be "less motivated". This strengthens the previous hypothesis that the learning model implemented in the experimental class is effective in increasing students' motivation to learn mathematics.

3. The Effectiveness of The Implementation pf Numbered Cards Based Jigsaw Model on Students' Mathematics Learning Motivation

The results of testing the effectiveness of the implementation of the numbered cards based Jigsaw learning model were analyzed based on the results of the independent parametric inferential statistical test t-test. In table 10 below, the results of t count (17,543) t-table (-1,677) are obtained, so it can be concluded that there is effectiveness in applying the numbered cards based Jigsaw cooperative learning model on students' mathematics learning motivation.

Table 10 Statistical Testing Results of Students' Mathematics Learning Motivation

Independent Samples Test

Lavene's Test for Equality of Variance	T-test for Equality of Means							
Results Motivation Students' Questionnaire	F	Sig.	T	Df	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Equal Variances Assumed	.020	.889	17.543	52	-27.526	1.569	-30.677	-24.374
Equal Variances not Assumed			17.484	48.684	-27.526	1.574	-30.690	-24.362

The results of this analysis indicate that Jigsaw learning using numbered cards is significantly effective in increasing students' motivation to learn mathematics.

Discussion

This research was conducted as an effort to increase students' motivation to learn mathematics through the implementation of the numbered cards-based Jigsaw learning model. The choice of this learning model is to provide new experiences for students in learning (Mulyati, 2016) as an effective way of learning that can stimulate students to be active in learning (Aydin & Biyikli, 2017) and this new way is one of them by designing the implementation of Jigsaw learning by using numbered cards. This is important because any learning strategy design that is implemented will not provide any benefits and meaning without being supported by the optimal use of learning media (Khairunnisak, 2015).

This learning strategy is believed to be able to make students active in learning (Pelalawan & Kant, 2017), in addition to encouraging the spirit of student independence, it can also encourage increased student motivation and cooperative attitudes in learning. Given that one of the learning principles that is emphasized in its implementation is to instill the value of cooperation in student study groups. This statement is in line with the view of Lestari (2012:171), "Factors that influence student learning motivation are influenced by the implementation of teacher learning strategies".

According to the results of this study, it is known that students' initial learning motivation (the results of Questionnaire I), both in the experimental class and the control class, tends to be in the category of assessment that is less motivated. This shows that the description of the learning motivation of students who were the research samples in the two classes was not significantly different. Students' lack of motivation in learning mathematics, as shown in the results of Questionnaire I. It is caused by several factors, namely teacher factors and student factors. This includes the factor of the student learning environment which was not previously designed in a pleasant learning atmosphere so that it is difficult to build self-efficiency and student motivation (Subaidi, 2016) (Sugandi, 2013).

As for the data obtained from the results of questionnaire II students, that there is a difference in the description of students' motivation to learn mathematics after the learning process is carried out for three learning meetings. The difference in the description of learning motivation can be seen in the data on the results of filling out the experimental class questionnaire which has increased learning motivation from being less motivated to be highly motivated.

Different from the control class, it remains in the assessment category which tends to be less motivated and it is also indicated that more and more students show less motivated learning motivation. From previously there were only 16 students, which increased to 18 students who indicated that they were less activated in learning mathematics (data from comparison of the questionnaire I and questionnaire II).

The increase in the number of students who indicated that they were less motivated in learning mathematics in the control class indicated that the conditions for learning mathematics in that class were considered less effective in increasing students' motivation to learn mathematics. In contrast to the case with student learning motivation in the experimental class which increases consistently. Relevant to the results of this study, (Emda (2018) believes that changes in students' intrinsic motivation in learning are strongly influenced by an extrinsic motivation that comes from outside the students. extrinsic which can effect changes in student motivation (intrinsic motivation).

Based on this, it can be revealed that the significant increase in learning motivation is due to the provision of treatments designed in a Jigsaw learning atmosphere by utilizing the use of numbered cards. Including in the learning process

involves more students to prioritize the values of educational cooperation, so that in such circumstances student motivation will be built to succeed in achieving their learning goals. Including being able to build a scientific attitude in solving mathematical problems that he encountered in his daily life (Saefudin, 2012).

This strengthening is also relevant to the point of view of Hakim (2014), Sri Astiti & Widiana (2017) dan Sudrajat, et al (2018) that learning that is designed as attractive as possible will create effective learning that can have an impact on the quality of the student learning process, both in the field. Mathematics studies are included in various other fields of study. Likewise, the use of numbered cards also determines the effectiveness of the implementation of the learning model in creating the quality of learning (Sunaengsih, 2016).

However, the most important thing in its use is to make it easier for students to organize themselves in group learning activities when joining the home team and the expert team, to make students enthusiastic about learning and completing their learning assignments, and it can function as a tool to increase student learning concentration through mentioning cards numbers random items that have been distributed to students so that with the ownership of these cards all students feel that they will be appointed by the teacher is doing the learning assignments they give.

Conclusion

The implementation of the Jigsaw learning model can be applied using numbered cards. The benefits obtained in its application are to facilitate organizing student study groups in the original and expert groups, avoiding discrimination in the formation of study groups such as the gathering of group members of students who have the same intelligence or vice versa in one study group, students are more enthusiastic about participating in a series of active learning activities and The random mention of numbered cards in the task can help students concentrate in learning.

Based on the results of the implementation of learning, it is proven to be effective in increasing students' motivation to learn mathematics in elementary schools. And this can be seen from the description of the initial motivation of students, both the experimental class and the control class, which tend to be in the "less motivated" assessment category. Which is significantly different from the description of student learning motivation in the experimental class (the assessment category is highly

motivated). Meanwhile, the student's motivation to learn mathematics in the control class actually increased the number of students who showed signs of being "less motivated" in learning. Thus, the implementation of the Jigsaw learning model based on the use of numbered cards are proven to be effective in increasing students' motivation to learn mathematics better than before.

About the conclusions of the results of this study, it is suggested that the teacher as the learning implementer can apply the Jigsaw learning model which is designed by utilizing numbered card media as one of the learning alternatives that can increase students' motivation to learn mathematics in elementary schools. And it is also suggested to other researchers, especially those interested in education and teaching, to make the results of this study as material for further research studies to examine the effectiveness of the implementation of the Jigsaw learning model based on the application of these numbered cards media in different research cases.

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