

Students' Mathematical Communication Skills in Jigsaw with Neo Snake and Ladder Game Based on Self-Concept

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Abstract

This study aims to determine the mathematical communication skills in terms of students' self-concept in the Jigsaw cooperative learning model assisted by neo snake and ladder game. The method used in this research is mixed method with concurrent embedded design. This research was conducted in class IV at SDN Sukaratu 4 and SDN Sukaratu 1 Pandeglang in the 2018-2019 school year. Data is collected by tests, questionnaires and interviews. The results showed that mathematics communication skills in terms of students' self concept varied. This is shown from 11 students with high self concept categories obtained mathematical communication skills results in the form of 7 high category students, 2 medium category students and 2 low category students, from 9 students with self concept category being obtained mathematical communication ability results in the form of 1 high category student, 7 students in the medium category and 1 student in the low category, then 5 students in the low self concept category obtained mathematical communication skills in the form of 4 students in the medium category and 1 student in the high category.

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INTRODUCTION

Mathematical communication ability is one of the competencies that must be mastered by someone in learning mathematics. This is in accordance with the Ministry of National Education (2016), suggesting that the four abilities that must be mastered in learning mathematics are the ability to understand concepts, mathematical communication, mathematical reasoning and mathematical connections. The objectives of learning mathematics in the curriculum in Indonesia (2016), clearly state that the objectives to be achieved are: (1) problem solving skills; (2) ability to argue; (3) communication skills; (4) ability to make connections and (5) ability to represent. These five things are by NCTM (1996) known as the mathematical power process standard (Mathematical Power Process Standards).

Mathematical communication is the ability to express situations, drawings, diagrams or real world situations into mathematical language, symbols, ideas and mathematical models. According to Greenes & Schulman (in Nuryani, 2016), suggests that mathematical communication is not just expressing ideas through writing but also the ability of students in speaking, reading, discussing and analyzing and discourse. According to Fatimah (2012), mathematical communication is important because to solve problems systematically interpreting ideas requires communication skills. Mathematical communication is the most important part in mathematics. This is because mathematical communication is a way of sharing ideas and clarifying understanding. In addition, according to Clark (in Asikin & Junaedi, 2013), mathematical communication has an important role in mathematics learning, namely (1) tools to exploit mathematical ideas and help students' abilities in seeing various relationships of mathematical material, (2) tools to measure the growth of understanding and reflect mathematical understanding of students, (3) tools to organize and consolidate students' mathematical thinking, and (4) tools to construct mathematical knowledge, develop problem

solving, increase reasoning, foster self-confidence and increase social skills.

Some research results found that the mathematical communication skills of elementary students are categorized as not good. The results of research conducted by Rahmawati (2013), found that in mathematics learning students are still difficult to do mathematical communication. According to Darkasyi. et. al (2014), the low mathematical communication of elementary students is caused by communication that is not inline between the teacher and students.

To develop mathematical communication skills, learning models are needed that can encourage students to communicate mathematically. One learning model that can help students' mathematical communication skills in learning is the Jigsaw cooperative learning model. According to Murtono (2012), the Jigsaw type cooperative learning model is an excellent learning model used in classroom learning because it will enable students to be active so as to improve student communication skills. Meanwhile according to Indah (2013), said that Jigsaw is interesting learning and makes students become interested in learning. The results of a study conducted by Mulyani (2012), stated the results that students who use cooperative learning models of jigsaw type reached a percentage of 84.3% which initially only reached 50%.

An applying the learning model, media is needed that is expected to help the learning process to be better so that the learning objectives can be achieved systematically and directed. One of the media used is neo snake and ladder game media. Neo snake and ladder game media is a snake ladder game media that have been modified either in the form of the media or the rules of the game. According to Sari (2016), the snakes and ladders game can be used as a fun learning medium for students. Students will tend to be interested in the learning process.

In addition to learning models and media, teachers must also understand how students learn. One thing to note is the self concept. According to Hurlock (Rahman, 2012), Self

concept is a picture of someone about himself which includes physical, psychological, social, emotional, aspirations and achievements that have been achieved. According to Rahman (2012), the importance of having a self concept is to be able to focus on personality formation and at the same time become the core of personality which will further determine one's personality development.

The formulation in this study is how the mathematical communication skills of fourth grade students are viewed from the self concept in the Jigsaw type cooperative learning model assisted by neo snake and ladder game media. The purpose of this study was to find the mathematical communication patterns of fourth grade students in terms of self concept in the Jigsaw type cooperative learning model assisted by neo snake and ladder game media.

METHODS

This research uses combination methods (mixed methods) with concurrent embedded design. The population in this study were fourth-grade students of Sukaratu 4 Elementary School and Sukaratu 1 Elementary School in 2018/2019 school year. Data collection techniques performed by tests, questionnaires, and interviews.

To find out whether learning by using a cooperative learning model of jigsaw type assisted by neo snake and ladder game media is effective for data analysis using normality test statistics, homogeneity tests, average completeness tests, different and average tests (t test). Whereas for qualitative data analysis, the data is carried out by testing the validity of the data using triangulation of techniques and sources, then after finding the truly valid data the data is reduced, after the data is reduced the data presentation is continued and then the conclusion drawing.

RESULTS AND DISCUSSION

Student's Self-Concept

Self concept data obtained through a questionnaire. Subjects in the self concept questionnaire were grouped according to the grouping criteria (Azwar, 2016). The results of self concept are presented in the following table.

Table 1. Student Self Concept Results

Self concept	Students	Presentase (%)
High	11	20
Medium	9	36
Low	5	44
Total	25	100

Based on Table 1, it is found that subjects with the high self concept are 11 subjects and the results of mathematical communication ability are 2 low category subjects, 2 medium category subjects and 7 high category subjects. For subjects in the self concept group the moderate category numbered 9 subjects and the mathematical communication results obtained were 1 low category subject, 7 medium category subjects and 1 high category subject. For subjects in the self concept group the low category consisted of 5 subjects and the results obtained were 4 middle category subjects and 1 high category subject.

Student Mathematical Communication Ability Test Results

In the prerequisite test, it was found that the results of the mathematical communication test were normally distributed and homogeneous. The results of the analysis of the average completeness test obtained value $z_{.05} = z_{.45} = 0.396$ Because the value of $z_{count} = 1.039 > z_{.05} = 0.396$ then H_0 is rejected. This shows that the average value of mathematical communication skills is more than the graduation limit (KKM = 70). Furthermore, the average difference test statistic to find out the increase in students' mathematical communication skills in the control class and the experimental class obtained t count of 5.797 with t table of 1.708 which shows that $t_{arithmetic} > t_{table}$ or H_0 is rejected.

Based on statistical tests (t test), it was found that communication skills in the class using a cooperative learning 1 of jigsaw type supported by neo snake and ladder game were better than the control class.

Patterns of Mathematical Communication Ability in Terms of Self Concept

Mathematical communication skills of students on low self concept

a. High category

In subjects who have high category mathematical communication skills, the results show that in grammatical abilities, subjects can write mathematical symbols correctly and can answer problems in problems with logical, concise, coherent and complete algorithms. In addition, the subject is also able to interpret and evaluate mathematical ideas and is quite capable of making guesses on mathematical statements. In the ability to understand discourse, the subject is also able to write down what is known and asked and is able to provide logical conclusions. The subject showed good results even though the subject assumed that the results obtained were just a coincidence. This is consistent with research conducted by Suroso, Lis & Praktikto (2012) which states that negative or low self-concept will be difficult to assume that success is obtained from oneself.

Examples of subject answers to indicators of grammar skills and ability to understand discourse are presented in Figure 1.

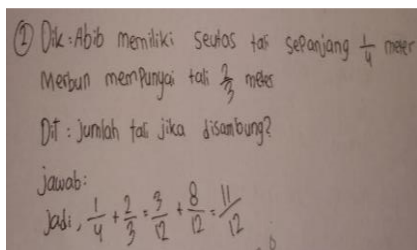


Figure 1. Subject's Answers Related to Indicators of Grammar Ability And Ability to Understand Discourse

On sociolinguistic abilities and strategic abilities. The subject is able to show good achievement. The subject can solve the problem in the form of images properly because the algorithm used is concise, logical, coherent and complete. In one of the problems, the subject draws a circle which is divided into two parts. One part is shaded to show that the result obtained is $\frac{1}{2}$. In this case the subject is able to

explain the reasons or basis for strategic writing. Examples of subject answers to indicators of sociolinguistic ability and strategic ability are presented in Figure 2.

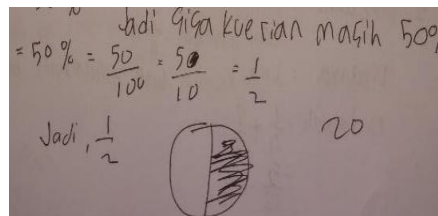


Figure 2. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

b.

c. Medium category

In subjects who have mathematical communication skills the category is showing the results that in grammatical abilities, the subject can write mathematical symbols appropriately and can answer problems in problems with logical, concise, coherent and complete algorithms. In addition, the subject is also able to interpret and evaluate mathematical ideas and is quite capable of making guesses on mathematical statements. Examples of subject answers to grammar skills and the ability to understand discourse are presented in Figure 3.

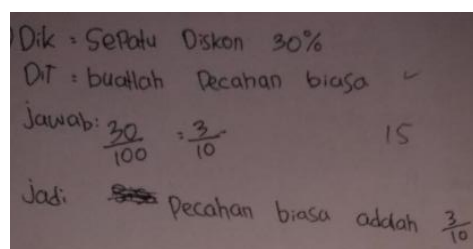


Figure 3. The Subject's Answers to Indicators of Grammar Skills and Ability to Understand Discourse

In sociolinguistic ability, the subject is still not capable enough to solve contextual problems in the form of images properly. The subject was still confused in deciding what picture to draw on the answer sheet. In addition, the strategic capabilities possessed by the subject are still lacking because in expressing the reasons for problem solving strategies, the subject has not

been able to use the algorithm in a concise, logical, coherent and complete manner. Examples of subject answers to indicators of sociolinguistic abilities and strategic abilities are presented in Figure 4.

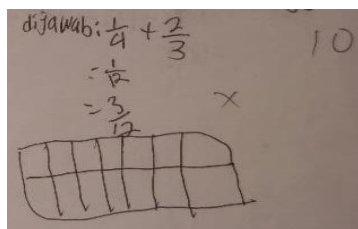


Figure 4. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

subject is also able to state the reasons or basis in explaining the problem solving strategy properly. Examples of subject answers to sociolinguistic abilities and strategic abilities are presented in Figure 6.

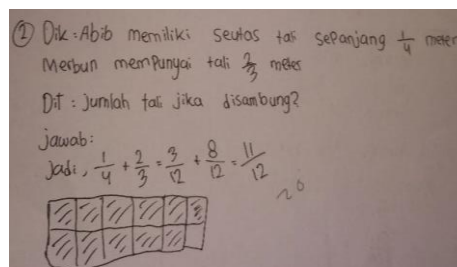


Figure 6. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

Mathematical communication capabilities in medium self concepts

a. High category

In subjects who have high category mathematical communication skills show the results that the ability of grammar, the subject can write mathematical symbols appropriately and can answer problems in problems with logical, concise, coherent and complete algorithms. In addition, the subject is also able to interpret and evaluate mathematical ideas and is quite capable of making guesses on mathematical statements. Examples of subject answers to grammar and discourse skills are presented in Figure 5.

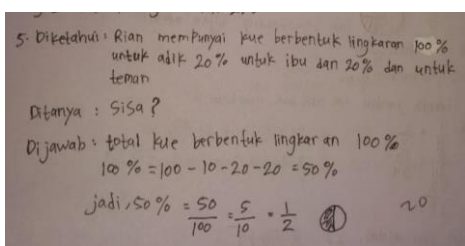


Figure 5. Subject's Answers Related to Indicators of Grammar Ability and Ability to Understand Discourse

On sociolinguistic abilities, the subject is able to solve contextual problems in the form of images. In one of the problems, the subject made a rectangular image which was divided into 12 parts, 11 parts shaded so that it showed the value of 11/12 fractions. In the strategic ability, the

b. Medium category

In subjects who have mathematical communication skills the category is showing the results that in grammatical abilities, the subject can write mathematical symbols appropriately and can answer problems in problems with logical, concise, coherent and complete algorithms. In addition, the subject is also able to achieve the ability to understand the discourse shown by the subject is able to interpret and evaluate mathematical ideas and is quite capable of making guesses about mathematical statements. In addition, the subject is able to write down what is known and asked in the problem and in the final answer the subject is able to provide a logical conclusion. Examples of subject answers to grammar and discourse skills are presented in Figure 7.

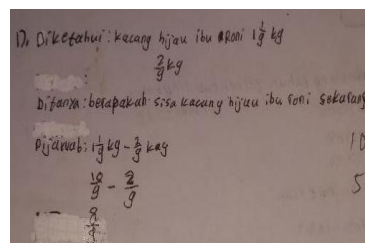


Figure 7. Subject's Answers Related to Indicators of Grammar Ability and Ability to Understand Discourse

On sociolinguistic abilities and strategic abilities, the subject is still experiencing errors in answering questions. In one of the problems, the subject was wrong in writing the problem solving strategy and for drawing the results of the final answer the subject tends to be careless in drawing. In the results of the interview, the subject also stated that there was a bit of confusion or doubt in answering the questions so that the answers written were not correct. Examples of subject answers to sociolinguistic abilities are presented in Figure 8.

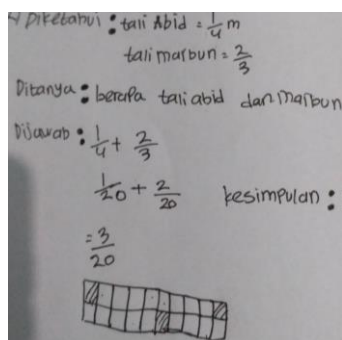


Figure 8. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

c. Low category

In subjects who have low mathematical communication skills, the results show that in grammar abilities, the subject can write mathematical symbols, it's just not so precise. In addition, the ability to understand the subject's discourse is only able to write what is known and what is asked on the problem. Examples of subject answers to grammar skills and the ability to understand discourse are presented in Figure 9.

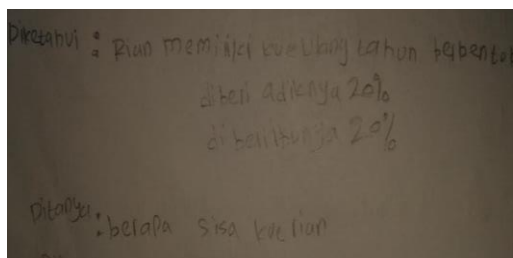


Figure 9. Subject's Answers Related to Indicators of Grammar Ability and Ability to Understand Discourse

In sociolinguistic ability, the subject has not been able to represent the results of the answers into the form of images. The subject was still confused about what picture should be drawn on the answer sheet. the interview also shows the result that the subject is still confused about what to draw because even in the process of solving a problem the subject tends not to understand the steps of the solution. This is related to the strategic ability of the subject where the subject has not been able to state the reasons or basis in explaining the problem-solving strategy properly. Examples of subject answers to sociolinguistic abilities and strategic abilities are presented in Figure 10.

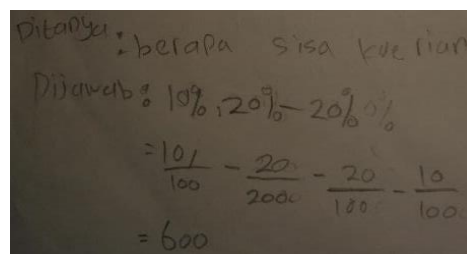


Figure 10. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

Mathematical Communication Skills in High Self Concepts

a. High Category

In subjects who have high mathematical communication skills, the results show that in indicators of grammar ability, the subject can write mathematical symbols correctly and can answer problems in problems with logical, concise, coherent and complete algorithms. In addition, the subject is also able to write what is known and asked in the problem and in the final answer the subject is able to provide a logical conclusion. Examples of subject answers to grammar and discourse skills are presented in Figure 11.

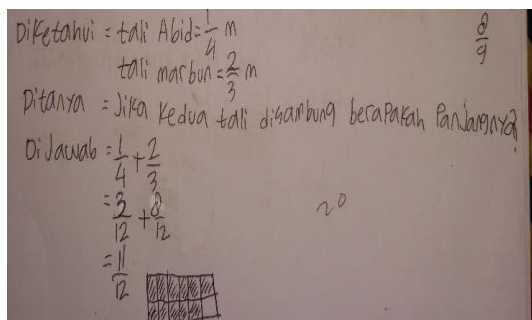


Figure 11. Subject's Answers Related to Indicators of Grammar Ability And Ability to Understand Discourse

On sociolinguistic abilities and strategic abilities, the subject is able to solve contextual problems in the form of images properly. In one problem, the subject is able to draw a rectangle that is divided into several parts and in certain parts of the subject shading so that it can show fractions.

In any strategic ability, the subject is very able to state the reasons and basis in writing the strategy well on the answer sheet. Examples of answers to sociolinguistic abilities and strategic abilities are presented in Figure 12.

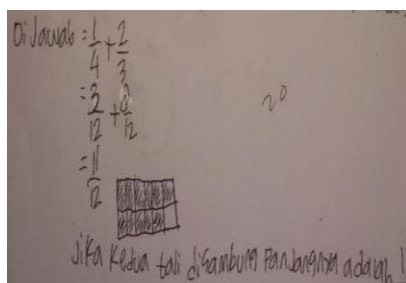


Figure 12. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

b. Medium Category

On subjects who have mathematical communication skills the category is showing the results that on indicators of grammar ability, the subject can write mathematical symbols appropriately and can answer problems in problems with logical, concise, coherent and complete algorithms. In addition, the subject is also able to interpret and evaluate mathematical ideas and is quite capable of making guesses on mathematical statements. Examples of subject

answers to grammar skills and the ability to understand discourse are presented in Figure 13.

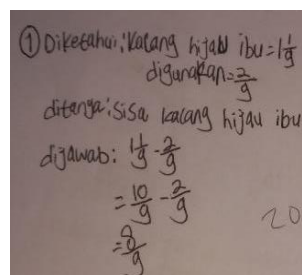


Figure 13. Subject's Answers Related to Indicators of Grammar Ability and Ability to Understand Discourse

In sociolinguistic ability, the subject is less able to interpret the results of the answers into the form of images. In one of the problems, the subject only drew a square without shading at all. In addition, the strategic ability of the subject is not yet able to express reasons or basis in explaining the problem-solving strategy properly. Examples of subject answers to sociolinguistic abilities and strategic abilities are presented in Figure 14.

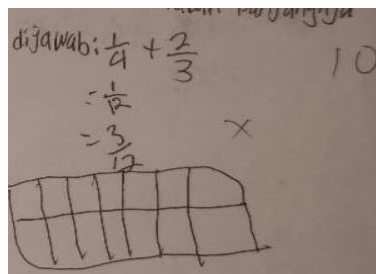


Figure 14. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

c. Low Category

On grammar skills. Subjects can write mathematical symbols well and answer problems in problems with a concise, logical, coherent and complete algorithm. Even so, the subject realizes in the belief that answering questions is still half sure, but the subject is able to maintain his ability in answering questions. On the ability to understand discourse. Subjects are able to reach the standard of interpreting and evaluating mathematical ideas and making guesses about

mathematical ideas and are able to write down what is known and what is asked and the subject is capable enough to give good conclusions.

Although at the beginning of working on the problem, the subject is not too sure and not fully confident. This is in accordance with Saputro (in Muhamad, 2016: 14), stating that self-confidence is the key to success in learning. Because without self-confidence students will not be successful in interacting with their friends and apart from that without self-confidence students will hesitate in working on problems and will not be optimal in solving problems in class. Examples of subject answers to grammar skills and the ability to understand discourse are presented in Figure 15.

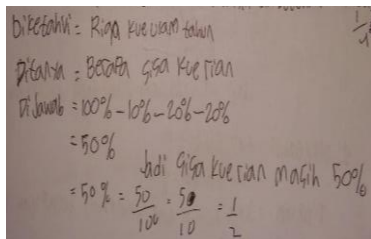


Figure 15. Subject's Answers Related to Indicators of Grammar Ability and Ability to Understand Discourse

On sociolinguistic abilities and strategic abilities. Subjects can solve contextual problems into a good picture. However, the strategic ability of the subject is still wrong in mastering the way to solve the problem because in one of the questions the subject writes the final result that should be $5/10$ to $15/10$.

However, the subject will correct mistakes by learning again. This is in line with the opinion of Aini (2016), also mentions that the characteristic of a high self concept is having an attitude of being able to improve itself because it is able to express aspects of personality that are not favored or try to change it. Examples of answers to questions on sociolinguistic abilities and strategic abilities are presented in Figure 16.

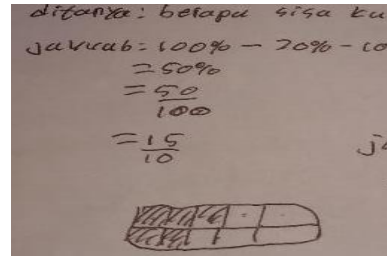


Figure 16. The Subject's Answers to The Indicators of Sociolinguistic Abilities and Strategic Abilities

CONCLUSION

Based on the results of the analysis and discussion of the results of the description of students' mathematical communication skills in terms of students' self concept shows varied results. This means that the Jigsaw cooperative learning model assisted by neo snake and ladder game media is effective and has an impact on students' varied mathematical communication abilities. Therefore, the effectiveness of learning remains the focus of learning activities.

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