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The Effect of RANDAI Learning Model on Students' Mathematical Communication Ability at SMA Negeri 7 Padang

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ABSTRACT

The low mathematical communication skills of students are caused by a learning process that is not fully student-centered. Furthermore, the learning models used so far have not been optimal or varied. This research aims to determine the mathematical communication skills of class XII students at SMA Negeri 7 Padang. This research is a quasi-experimental study with a pretest-posttest control group design. The population in this study was all students of class XII science at SMA Negeri 7 Padang in the 2023/2024 academic year. The research sample consisted of students in class XII IPA 3 as the control group and XII IPA 4 as the experimental group. The sampling technique used was total sampling. The instrument used was a question sheet containing essay questions consisting of 5 questions. The results show that the mathematical communication skills of experimental class students are higher than those of the control class with an average of experimental class pretest (65.18), experimental class posttest (80.23), control class pretest (55.21) and control class posttest (67.85). Data analysis was carried out using the Paired Sample T-test which showed that the significance value for the sample class was <0.05, namely 0.00. So it can be concluded that there is an effect of applying the RANDAI learning model on students' mathematical communication skills in class XII SMA Negeri 7 Padang.

***Keywords*: Learning model, RANDAI, Mathematical communication skills**

1. INTRODUCTION

In the 21st century, education is facing an era of globalization. In the era of globalization in the 21st century, it is necessary to anticipate the need to improve thinking skills, especially high-level thinking skills. Higher order thinking is a complex thinking process that is categorized into problem-solving, decision-making, creative thinking, and critical thinking (Liliasari., 2001). Therefore, the education sector in Indonesia must undergo renewal. The low quality of education in Indonesia is one of the problems. Various efforts to improve the quality of education have been made, but until now, the quality of education has not demonstrated a significant increase (Yani, 2018). Curriculum, facilities, and infrastructures, teachers, students, learning models of, as well as selecting appropriate learning media are also interrelated components that support the achievement of specified educational goals (Suardi, 2012).

Currently, there is still a lack of attention and accommodation to culture and local wisdom in society in curriculum development. As well as ignoring the values held by a full society with local potential values, especially in science learning (Sutarto, 2017). In science learning, it is necessary to carry out integrated learning of local culture and potential. It will establish a balance or harmony between scientific knowledge itself and the cultivation of a scientific attitude as well as cultural values that exist in society. This aim is to ensure that science education is not only for increasing understanding of science but also to understand human life itself (Suastra, 2010).

Minister of Education and Culture Regulation Number 56 of 2014 states that the aim of mathematics learning is for students to compile mathematical proofs using complete sentences, tables, symbols, diagrams, or other media, and to communicate ideas and reasoning. To achieve this goal, students must master mathematical communication skills. (Umar, 2012) stated that

mathematical communication skills are the ability that students have to be able to communicate or convey their ideas in an effort to solve problems given by the teacher, participate actively in discussions, ask questions, and be accountable for their answers to problems. According to (NCTM, 2000), the reason why students' mathematical communication skills are important is that mathematical communication can help students consolidate and organize their mathematical thinking both in writing and orally so that responses between students can occur in the learning process.

The results of the 2015 TIMSS assessment (Mullis IVS, 2016) show that the average score obtained by Indonesia is 397 and is ranked 44th out of 49 participating countries. The average scale score obtained for each assessment for understanding is 395, application is 397, and reasoning is 397. Based on the TIMSS assessment results, it can be seen that the mathematical abilities of students in Indonesia are still relatively low. One of the mathematical abilities that is classified as low is mathematical communication skills, which can be caused by students' confusion in presenting ideas or concepts in the form of symbols, graphs, tables, or other media to clarify mathematical problems.

Based on the results of observations made by researchers at SMA Negeri 7 Padang and an interview with one of the mathematics teachers at the school on February 25th February 2023 said that when the teacher gives a problem that is related to the students' real life, the students become confused and have difficulty in solving the problem. Students have difficulty in solving the problems presented in accordance with the concepts that have been taught. The lack of application of mathematical concepts has an impact on student learning outcomes, which are less than satisfactory.""The results of an analytical study conducted by Wardhani and Rumiati (Salam, 2017), the cause of the low mathematics achievement of Indonesian students in the TIMSS results is due to the weakness of Indonesian students in working on questions that require several abilities, one of the abilities needed is mathematical communication skills. This finding is consistent with the research conducted by (Hikmah, 2019) that class VII students at SMP IT Riau Global Pekanbaru have mathematical communication skills that have not developed optimally, some students still have difficulty and are even unable to write down their mathematical ideas. Students' mathematical communication skills were not achieved due to several obstacles and difficulties experienced in communicating mathematical problems.

(Buhaerah, 2011) stated that students are only asked to solve problems without practicing their communication skills, which results in students' mathematical communication skills being low. Baroody, Miriam, et al. (Sari, 2014) stated that mathematical communication is not only expressing ideas through writing but also students' abilities in speaking, explaining, explaining, drawing, asking questions and working together. It is challenging for students to provide logical, precise, and clear explanations for their answers because they are not asked to convey mathematical ideas when learning at school. The low mathematical communication skills of students depend on the learning activities that occur in the classroom.

An initial preliminary study conducted by researchers at SMA Negeri 7 Padang shows that students' mathematical communication skills are still low. This was demonstrated when researchers conducted initial research on class X students at SMA Negeri 7 Padang on 27th February 2023 by providing problem-based questions on systems of linear equations in two variables. According to a preliminary study conducted by researchers, out of the 36 students who took the test, only 6 were able to answer the questions correctly. Meanwhile, 30 students had difficulty understanding the questions and were unable to answer them correctly, resulting in mismatched answers. This indicates that 83% of the students had difficulty solving the questions. This suggests that students' communication skills in mathematics are still low. This fact proves that students' mathematical communication skills are still low. Many factors cause

students' mathematical communication skills to remain low, one of which is that students still rarely train themselves to solve realistic problems. Besides that, it can also be concluded that students do not understand the meaning of the questions and the mathematical concepts that can be used. Students do not understand how to make mathematical models of the presented problems. Students' mathematical communication abilities still appear to be far from expectations.

One solution that can be applied to developing students' mathematical communication skills is through a problem-based learning model. (Bahri, 2018) proves that the students who carry out learning using the problem-based learning model have higher results compared to students who carry out learning using direct learning model with appropriate learning materials. Several supporting factors influence students' ability to solve problems, including the use of learning models, learning methods, media used, and the conditions of the learning environment created by the teacher during learning (Hanifa, 2019).

Problem-Based Learning Model can improve students' communication skills. According to the results of his research, he concluded that the LKPD with the Problem-Based *Learning Model* that was developed meets the criteria of being valid, practical, and effective for improving mathematical communication skills. (Ridwan, 2016) stated that the concept of problem-based learning is a method that asks students to work together in groups to find solutions to real problems. In addition to the learning model used in the classroom, other aspects are still present in current curriculum development. Lack of attention and accommodation to culture and local wisdom in society, as well as ignoring the values held by the community, which are full of local potential values, especially in learning (Sutarto, 2017). In mathematics learning, it is necessary to integrate local culture and potential into the learning process. This will create a balance or harmony between mathematical knowledge and the cultural values that exist in society. The aim is to ensure that mathematics education not only enhances understanding of mathematics but also of human life itself (Suastra, 2010).

Problem-Based Learning Model will be improved if it is integrated with culture. The goal is to develop students' mathematical communication skills and foster a sense of appreciation for their own culture. The culture that will be integrated with the Problem-Based *Learning Model* is the Randai dance in Minangkabau Culture. The integration of culture into the learning model is expected to make learning more meaningful.

Problem-Based Learning Model starts with a problem orientation presented in the form of *a kaba* (story) called *Reading*. The second stage involves analyzing the problems presented in *the Kaba* (story), which is called *Analyzing*. The third stage entails narrating the solution to the presented problem, which is called *Narration*. The fourth stage involves discussing solutions to the presented, which is called *Discussion*. The fifth stage involves carrying out an evaluation (assessment) process in the problem-solving process, called *Assessment*. The final stage involves implementing solutions to the presented problems in everyday life, which is called *Implementation*. Based on the aforementioned problems, this is the basis for researchers conducting research with the title " The Influence of the RANDAI Learning Model on Students' Mathematical Communication Ability Padang 7 Public High School ".

2. LITERATURE REVIEW AND HYPOTHESIS

Mathematical Communication Skills

According to Baroody (Nofrianto, 2017) mathematical communication skills have several aspects that must be fulfilled, including the ability to present, listen, read or understand, discuss,

and write mathematical ideas into mathematical language. Schoen, Bean, Ziebarth (Hasratuddin, 2015) mathematical communication is a person's ability to explain an algorithm and unique ways of solving problems, to explain real-world phenomena presented graphically, words, equations and tables. There are many methods used to improve mathematical communication, such as those carried out by (Putra, 2016) the influence of the Reflective learning model, the Realistic Mathematics Approach (Nofrianto, 2017).

Sadiq (Salam, 2017) believes that mathematical communication skills are a person's ability to communicate mathematical ideas and thoughts. Berelson and Steiner (Tinungki, 2015) argue that communication is the process of conveying information, ideas, feelings, skills, and others with the use of symbols such as letters, pictures, numbers, and so on. Based on the experts' explanations, it can be concluded that communication skills in mathematics refer to a person's ability to convey information and ideas related to mathematics in linguistic form.

NCTM (Sufi, 2016) states that mathematical communication skills are the ability to: (1) organize and consolidate thinking student mathematics through communication; (2) communicate their mathematical thinking coherently and clearly with other students or with the teacher; (3) analyze and evaluate mathematical thinking and other strategies; (4) use mathematical language to express mathematical ideas precisely. According to Barody in Choridah (Sufi, 2016) there are two reasons why mathematical communication is important, namely: (1) mathematics as a language, meaning mathematics as an internal language conveys information, and (2) mathematics is learning as a social activity, it means as a social activity because in mathematics learning there is interaction and communication between teachers and students as well as students and students. There are several indicators put forward several indicators to measure the ability of students' mathematical communication. One of them is an indicator of communication skills in mathematics, as proposed by Baroody & NCTM (Surya, 2018), namely:

a. Expressing a mathematical ideas or situation from a picture or drawings, written words themselves in written form;
b. Expressing the situation in the form of a picture or graph;
c. Able to express situations in the form of mathematical notations or models mathematics (mathematical expressions).

Randai Dance

Art is one part of culture, and among the Minangkabau people, various types of art thrive and develop, such as sound art, dance, painting, theater art, literary arts, and others. One of the Minangkabau arts that incorporates elements of several branches of art is Randai. Randai is a combination of movement art, sound art, literary art and theater art.

Randai is a dance by a group of people who move in a circle, and dance while singing and clapping, and most importantly, present a story. Some consider Randai to be a Minangkabau theater art because it includes dialogue or a story that is told. Randai is also known by some people as traditional Minangkabau theater, as it contains elements of sound or music and storytelling. And no less important in Randai is the art of movement or dance. In Randai there is an audience and performers, which is a characteristic of traditional theater.

Randai is often performed as an introduction to Ulu Ambek. Ulu Ambek is a movement art that is displayed during the appointment of the Penghulu. The movements in Randai are agile and sharp, describing the basic characteristics of pencak silat. The characteristic appearance

involves wearing Galembong trousers. Galembong trousers have wide legs, while Pisak trousers are wide and loose according to Harun (Yetti, 2010).

Structurally, Randai has various elements of art that can be categorized as main and supporting elements. The main elements of Randai are essential to its uniqueness and must be present in a production. If any of these elements are missing, it means eliminating the essential elements and uniqueness of Randai. Otherwise, a new art form will be created that cannot be called Randai. The main elements of Randai include stories, singing or gurindam, dance or waves, dialogue, and acting. As for costumes or clothing, make-up, and traditional music other than singing, they can be categorized as supporting elements in Randai's work. Without these supporting elements, Randai's work can still be carried out. However, the presence of supporting elements is still expected to add value to the perfection of Randai's work as a whole and also to enhance or strengthen its uniqueness as Minangkabau folk theater.

3. RESEARCH AND METHODS

This type of research is quasi-experimental research with a pretest-posttest control group design, which aims to determine the influence of the RANDAI learning model on the mathematical communication skills of class XII students at SMA Negeri 7 Padang. The population in this study includes all students in class X II of SMA Negeri 7 Padang in the 2023/2024 academic year . The sampling technique used was total sampling, where class XII IPA 3 students were the control class, applying the discovery learning model, and Class XII IPA 4 was the experimental class, applying the RANDAI learning model. The instrument used was a question sheet containing essay questions consisting of 5 questions. The questions given required completion at the beginning (pretest) and at the end (post-test). Data analysis in this study used paired sample t-test analysis with the help of SPSS 26 for Windows.

4. RESULTS AND DISCUSSION

Based on the research that has been carried out at SMA Negeri 7 Padang regarding the influence of the RANDAI learning model on the mathematical communication skills of Class XII SMA Negeri 7 Padang, it was found that the students' scores in the experimental class were higher than those in the control class. Based on the results of statistical calculations, the mean, minimum value, and maximum value for the two samples were obtained. The average pretest score in the experimental class was 6 5.18 and in the control class, it 5 5.21. The average posttest score in the experimental class was 80.23 and in the control class, it was 6 7.85. The difference in test results was an increase in the post-test in the two sample classes. The data obtained was then analyzed to determine differences in students' mathematical problem-solving abilities in the sample classes by carrying out normality tests, homogeneity tests, and hypothesis tests.

Data normality test used the Kolmogrov-Smirnov test, assisted by the SPSS 26 for Windows program. It was found that the residual data on students' mathematical communication abilities were normally distributed. This is important because the significant value of the data obtained was > 0.05, proven by the significant value of the class's significant experimental class was 0.214, the posttest significant value of the control class was 0.245, the pretest significant value of the control class was 0.256 and a posttest value for the control class was 0.289. Test data homogeneity using the Levene test, assisted by the SPSS 26 for Windows program. It was found that the data variance in the mathematical communication abilities of the sample class students was homogeneous. This is because the significant value of the data obtained was > 0.05,

namely 0.325. After conducting the normality and homogeneity tests, the results were obtained that the data was normally distributed and homogeneous, allowing for hypothesis testing to be carried out.

Hypothesis testing used a paired sample t-test with the help of the SPSS 26 for Windows program. The result obtained was that the sig value. (2-tailed) was 0.000, where this value is smaller than the significant value of <0.05. This proves that there is a significant difference in students' mathematical communication abilities between the experimental class and the control class.

5. DISCUSSION

This research was conducted at SMA Negeri 7 Padang,applying the RANDAI learning model for the experimental class and the discovery learning model for the control class. Based on hypothesis testing, it was found that the RANDAI learning model had an effect on the mathematical communication skills of class XII students at SMA Negeri 7 Padang. Research data on students' mathematical communication skills was obtained from measurement test results using essay question sheets in the form of cases. Based on the pretest and posttest scores for each indicator of students' mathematical communication skills, it is known that they increased in value in both sample classes. However, the increase that occurred in the experimental class was higher than that in the control class. That matters because, through the RANDAI learning model, students learn to think critically about presented problems, express ideas for solving problems, and conduct investigations to analyze and evaluate the problem-solving process. Savery (2006) stated that the problem-based learning model centers on students doing research, integrating theory, and applying knowledge and skills to develop the best solution for the problem at hand.

6. CONCLUSION

Based on the research results, it can be concluded that the application of the RANDAI learning model influences the mathematical communication abilities of class XII students at SMA Negeri 7 Padang. Based on the research carried out, the following recommendations are made:

1. The RANDAI learning model has systematic stages and can improve students' mathematical communication skills. It is recommended that teachers be able to apply the RANDAI learning model to improve students' skills.
2. Future researchers are advised to improve research designs, such as the Solomon four-group pretest - posttest design.

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