The relationship between mathematics resilience and mathematics communication skills

Rifdah¹, and N Priatna²

¹School of Postgraduates, Universitas Pendidikan Indonesia, Jl. Dr. Setia Budhi No. 229, Bandung 40154, Indonesia
²Department of Mathematics Education, Universitas Pendidikan Indonesia, Jl. Dr. Setia Budhi No. 229, Bandung 40154, Indonesia

*corresponding author: rifdahkurniawan@upi.edu

Abstract. In general, the purpose of this research is to find out whether there is a relationship between students’ mathematical resilience and students’ mathematical communication skills. This research conducted in a private junior high school in Tangerang class VIII-I even semester in the 2018/2019 academic year. The method of this research is a survey method with the correlation technique. The sampling used the purposive sampling technique, which is determined and sampling technique determined by researchers with certain considerations. The sample consisted of 20 students. The material used in this research was the volume and surface area of the cube. The research instruments were 4 problems with communication mathematical skills and 30 statements of resilience statement. The conclusion of this research is that there is a positive correlation between mathematical resilience to communication mathematical skills; which is equal to 0.448.

1. Introduction
Mathematics is an important knowledge in the field of education. Many efforts to improve the mathematics learning system with approaches or learning methods have been carried out by many educators. The improvement aims to form Indonesian human resources who have critical, systematic, logical, creative and effective thinking so as to overcome the various challenges and problems that exist. One way that can be done to achieve these goals is to develop educational programs that focus on developing students’ mathematical thinking skills. Communication skills are one of the abilities that need to be developed in mathematics learning. Communication mathematics is an ability that must be possessed by junior high school students. Hendriana, Rohaeti, and Sumarmo [1] summarizes the opinions of several experts and NCTM and identifies several mathematical communication skills, among others: declaring a situation in the form of images, diagrams, languages, symbols, expressions, or mathematical models; and conversely express images, diagrams, languages, symbols, or expressions into their own language. One of the competencies students must have is to use language to understand, develop, and communicate ideas and information, and to interact with other people. On general competence Material mathematics studies mentioned that by learning mathematics students expected to have the ability to communicate ideas with symbols, tables, graphs to clarify the situation or problem [2]. Based on observations conducted by researchers at the private junior high school in Tangerang, some information was found that the mathematics learning process carried out in schools had not fully been able to facilitate students’ communication skills. So in the process of learning
mathematics indeed it is very important for students to have the ability in terms of mathematics communication. Where learning communication in mathematics helps the development of interaction and expression of ideas in the classroom because students learn in an active atmosphere. But in reality, students’ mathematics communication skills are still low [3]. This is due to a lack of student activity where they have not done activities that are more meaningful to the maximum such as discover mathematical concepts and principles, explore concepts, and do an analysis of mathematical problems.

Mathematics learning generally still takes place traditionally with teacher-centered characteristics, so that teachers dominate in mathematics learning activities while students are classified as passive, besides that training is given more routine questions so that it is less facilitating students in developing their mathematical communication skills [4]. Therefore, students tend to have difficulties when given non-routine questions that can facilitate mathematical communication skills, so that to achieve mathematical communication skills not only requires the assignment of mathematical content, but needs to be supported by strong desires, perseverance, toughness, and not easy give up in solving mathematics problems that facilitate mathematics communication skills. One affection that can support mathematics communication skills is mathematics resilience. Resilience is an attitude of abstinence in the face of a challenge.

The importance of mathematics resilience can be seen in mathematics education research, because students experience obstacles, difficulties, fears, and anxieties in solving a mathematical problem, then they become dislike to mathematics [5]. This causes the students to avoid learning and solving a mathematical problem. To overcome anxiety, fear in facing challenges and difficulties, requires hard work and good language skills, students need to have a diligent and resilient attitude that is contained in mathematical resilience [1]. Perseverance is very important for learning mathematics because students develop conceptual understanding because they struggle productively with ideas that are not immediately visible [6]. Mathematics resilience has four factors, namely: believing that the brain's ability can be grown; personal understanding of mathematical values; understanding how to work in mathematics; and awareness of peer support, other adults, ICT, the internet, and others [7]. To develop mathematical resilience in a person the main factors should be considered, namely: choosing and determining something that will be done during the class; train themselves as part of their environment; feel involved in the learning process, both in attitudes and values. In essence, the concept of mathematics resilience as a positive adaptive attitude towards mathematics gives students the opportunity to continue learning mathematics despite [7].

Many STEM students are not strong in their 3rd year and as many as 48% are out of their majors, and this proves that resilience is needed when solving problems in lessons mathematics [8]. High mathematics resilience will allow students to continue to study mathematics even though they experience difficulties. Whereas lower rehabilitation will reduce their perseverance in learning mathematics when facing difficulties. In general, students’ mathematics resilience is still relatively low; self-control of most students in facing mathematics learning problems is still relatively weak. Some students when faced with difficulties in solving problems of opportunity theory, do not try to ask their friends or lecturers. But usually, avoid difficult tasks. In the end, many students just copied the work of their friends. Students are afraid to ask questions and answer questions during lectures [5].

Based on the information on the low mathematics communication skills of students that the researcher obtained when making observations, it must be improved by paying attention to aspects of mathematics resilience. Fortunately, developing students’ communication skills and mathematics resilience requires learning that has the characteristics of building categories, solving problems, and creating a supportive environment. Given that mathematics communication skills are classified as high order thinking skills, it requires mathematics resilience in students. According to Hendriana, Rohaeti, and Sumarmo [1], the indicators of mathematics resilience that used in this study are: "a) shows an attitude of confidence, resilience, hard work and difficulty giving up in facing problems, failures, and uncertainties; b) shows the desire to socialize, has an attitude to help each other, discuss with peers, and be able to adapt to the surrounding environment; c) bring new thinking and find creative solutions with challenges; d) failure is used as an experience to build self-motivation; e) have curiosity, reflect,
research, and utilize various sources; f) have the ability to control themselves, and be aware of their feelings” [9]. Based on the description above, researchers feel the need to conduct research to find out whether there is a relationship between students' mathematics resilience to students' mathematical communication skills.

2. Methods
This research aims to find out whether there is a relationship between students’ mathematical resilience and students’ mathematical communication skills. This research was carried out in private junior high school in Tangerang, class VIII even semester in the school year 2018-2019. This research was conducted at a private junior high school in Tangerang. The procedure of this study has three stages, namely planning, implementation, and reporting. In the early stages of planning activities, things are done that are compiling test instruments for mathematics communication skills and compiling non-test instruments for mathematics resilience. At the stage of the implementation of the activities carried out is to provide a test of students' mathematics communication skills and then provide a mathematics resilience questionnaire that has been prepared. At the reporting stage, collecting data from questionnaires and test instruments obtained during the study took place as well as processing data and then making reports on research results. The method used is survey method with the correlation technique. Sampling in this study was purposive sampling. Purposive sampling technique is a technique of determining and sampling that is determined by researchers with certain considerations [9]. Considerations made in this purposive sampling technique can vary and depend on the needs of the research to be conducted. The study sample consisted of 20 students. To find out the relationship between mathematical resilience to mathematics communication skills, the data normality test, and correlation test were carried out. The Mathematics test used is a mathematical communication ability test. So that students' mathematics communication skills can be seen, the test is made in the form of a description. To obtain good test questions, the test questions must be assessed for validity, reliability, difficulty level and distinguishing features. To get validity, reliability, level of difficulty and distinguishing features, the problem is first tested in another class in school at the same level. To calculate the validity of reliability, difficulty and differentiation items using the Microsoft Excel program. The development of students' mathematics resilience variable instruments about mathematics begins with the preparation of 30 statements that are complemented by 4 answer choices namely SS (Very Often), S (Frequently), J (Rarely), JS (Rarely). Each choice of answers proposed has a score between 1 to 4. Variable scores can be obtained by adding up all of the item scores. The instrument calibration process was carried out by testing 20 respondents. In the test phase, the instrument was tested for the validity of items and the calculation of the reliability coefficient. Examples of test instruments are presented in Table 1.

| No | Geometry tasks |
|----|----------------|
| 1. | Beni will make a cube framework that has a rib length of 6 cm using wire and stained. Draw the cube skeleton model and calculate the wire needed to make the cube skeleton model! |
| 2. | Dian wants to make a cube box without a lid with a piece of cardboard. He wants to make the box with 14 cm ribs. Help Dian to make the box by first drawing the sketch and calculating the area of the carton needed. |
| 3. | In my grandfather's village, there is a water reservoir. The tub is cube with 80 cm long ribs. If the tub is filled with water using a bucket whose volume is 4 liters, how many times should a bucket of water be poured to fill the tub until it is full? Explain! |
| 4. | Bella will package a small cube-shaped box with 1 cm ribs into a large cube-shaped box with a rib size of 5 cm. Make a sketch based on the illustration above, and help Bella count how many small boxes if the large boxes are filled to the brim. |
| 5. | The district education office will create new schools in remote areas within the district. The education office has a target that the school has 30 classy students. They will build a cube- |
shaped school for each classroom, while a student ideally needs 6 m³ of indoor air. Help
them determine the height of the classrooms to be built so that students can learn
comfortably.

Tabel 1 shows the instrument of mathematics communication ability consisting of 5 item
description items. The achievement indicators contained in the instrument are Calculating the surface
area of the cube, and calculating the volume of the cube.

3. Result and Discussion
3.1. Result
Based on the mathematical communication ability test, we obtained data. To find out whether the data
were normally distributed, the Kolmogorov-Smirnov Test one-sample was tested using SPSS 24 with
α = 0.05. If sig > 0.05, the data is normally distributed, whereas if sig < 0.05 the data is not normally
distributed [10]. The value of significance is 0.200. So, the data are normally distributed at the 0.05
significance level. Then a correlation test was conducted to find out whether there is a relationship
between mathematical resilience and students' mathematical communication skills.

Hypothesis:
H₀: There is no significant relationship between students 'mathematical resilience to students'
mathematical communication skills.
H₁: There is a significant relationship between students 'mathematical resilience to students'
mathematical communication skills.

Correlation criteria α = 0.05, If sig > 0.05 then H₀ is accepted. If sig < 0.05 then H₀ is rejected. N
shows the number of samples as many as 20 students. While the correlation relationship (pearson
correlation) is indicated by the number 0.448(*). This means that there is a significant correlation
between mathematics resilience and mathematics communication skills of students, that is 0.448. Sig
number. (2-tailed) is 0.048 <0.05. So, H₀ is rejected. It can be concluded that there is a relationship
between mathematics resilience of students' mathematics communication skills.

To examine direct effect of students resilience mathematics to students' mathematics
communication skills, then we do the regression coefficient tests using linear regression analysis. The
regression equation is \( Y = -34.681 + 1.192X \). It means the higher student's mathematics resilience
score, the greater student's mathematics communication score, and vice versa. Because of the
significant value of 0.046 <0.05, it can be concluded that significantly students’ resilience about
mathematics in learning affects students' mathematics communication abilities. So students who have
good mathematics communication skills, also have good resilience.

3.2. Discussion
The results of the study showed that there was a relationship between mathematics resilience of
students’ mathematics communication skills and abilities. Because of the significant value 0.046
<0.05, it can be concluded that students' resilience about mathematics in learning affects students'
mathematics communication abilities, significantly. So students who have good mathematical
communication skills, also have good resilience. According to Newman in Hendriana, Rohaeti, and
Sumarmo [1], the ability of mathematical resilience allows students to overcome obstacles or
difficulties in learning mathematics. According to NCTM in [1], mathematical communication skills
are efforts made to find solutions to a problem by stating a situation in the form of images, diagrams,
languages, symbols, expressions, or mathematical models; and conversely express images, diagrams,
languages, symbols, or expressions into their own language. It can be said that students who have
good mathematical resilience will have good mathematical communication skills.

4. Conclusion
Based on the results of data analysis regarding the relationship between students' mathematics resilience and mathematics communication skills on the material volume and surface area of the cube, the conclusion from the findings obtained is that students' mathematics resilience in mathematical learning significantly influences students' mathematics communication skills. Resilience mathematics examined in this study is a mathematical resilience associated with mathematical communication skills. The next researcher can examine students' resilience mathematics related to other mathematical abilities.

5. References

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