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Mathematical Communication Skills in Terms of Self Efficacy Through Guided Discovery Learning Assisted Immediate Feedback

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Abstract

The purpose of this study to find patterns of mathematical communication skills in terms of self efficacy of guided discovery learning design assisted immediate feedback. The research method used is mixed method while the design is sequential explanatory. The research subjects consisted of thirty-two students of class VIIG SMP Negeri 1 Mijen, Demak. The techniques of collecting data were mathematical communication skills test and self-efficacy questionnaire. The results of this study are mathematical communication skills of students through guided discovery learning assisted immediate feedback effective, described mathematical communication skills in terms of self efficacy were categorized high, medium and low level of guided discovery learning design assisted immediate feedback.

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INTRODUCTION

According to Baroody in Asikin & Junaedi (2013: 204) mathematics is a tool to communicate various ideas clearly, precisely and concisely. Mathematics learning process in school basically is not only teaching students how to learn to count according to highly procedural algorithms, more than that mathematics has a goal that is students have a variety of skills including curiosity, confidence and have the ability to communicate mathematical ideas clearly and effectively (Permendikbud, 2013). Based on the results of Kostos and Shin's research (2010) students who have high mathematical communication skills will have greater understanding of mathematics.

According to (Hidayati, 2014; Priambodo, 2014; Sukendar, 2014; Ambarwati, 2015; Permata, 2015; Sefiany, 2016; Fauziah, 2017) mathematical communication skills are the ability of students that covers activities of communicating thought or ideas with symbols, tables, diagrams, and mathematical expressions to clarify a problem. Meanwhile, according to Follan (Noviyanti, 2013) mathematical expressions can be seen from everyday language. According to Fachrurozi (Priambodo, 2014) mathematical communication skills need to be the focus of attention in learning mathematics because through communication, students can organize and consolidate mathematical thinking and can explore mathematical ideas. In addition, according to Asikin (Sefiany, 2016) mathematical communication skills have an important role in mathematics learning as a tool for exploiting mathematical ideas and linking between mathematical material. So that mathematical communication skills are very important to be developed in students (Herfi, 2013).

Indicators of mathematical communication skills used in this study are mathematical communication indicators according to Satriawati (2014) consisting of: (1)Written Text that is, giving answers using their own language, modeling situations or problems using mathematical models in the form of: oral, written, concrete, graphical, and algebraic; (2)Drawing, that is, reflecting real objects, pictures, and diagrams into mathematical ideas; (3)Mathematical Expression, i.e. expresses mathematical concepts by expressing everyday events in language or mathematical symbols.

Based on Muklis research (2016: 418) self-efficacy or self-confidence simultaneously influences mathematical communication skills. According to Hamidah (2013) the higher self-efficacy of a person's ability both in formulating concepts, conveying ideas, and sharpening ideas to convince others, then the mathematical communication ability increases. According to Bandura's theory, as quoted by Mesterova (2015: 112) self-efficacy is one's belief in his ability to exert motivation, cognitive resources and actions needed in dealing with certain situations.

Based on observations made by researchers at SMP Negeri 1 Mijen that mathematical communication skills are reviewed from self efficacy in class VII F students is very low. This is based on the results of the pretest shows that students who achieve completion are only 11.11% while students who are incomplete are 84.21%. This is because some students find it difficult to change story problems into mathematical models. Students have difficulty expressing their ideas. In addition, when students are given the opportunity to present their work in front of the class, students only write their answers and do not explain the steps of completion because they are not sure of the results of the work they do or can be said that students' self efficacy are very low. Based on the results of interviews that researchers have conducted with mathematics teachers at SMP Negeri 1 Mijen, it is known that the teacher rarely gives feedback after formative test assessment and only chasing the material to be quickly finished without thinking about student learning completeness. However, feedback is very important to improve students' mastery and learning success (Silverius, 2009; Taras, 2010; Nicol & Macfarlane, 2012) especially feedback immediately or immediate feedback (Tatawy, 2012).

According to Dihoff et al (2012) immediate feedback is providing immediate feedback to improve classroom management and improve students' interaction in the classroom, and improve students' performance at school. Kehrer (2013) said that Immediate feedback has a very extraordinary role to help justify students' misconceptions in learning

immediately, so that students immediately know the location of their mistakes and can immediately correct them so as the possibility of the same error does not happen again**.** Immediate feedback which is very appropriate in improving mathematical communication skills in terms of self efficacy is immediate feedback in written form (Raharja, 2015).

In an effort to improve mathematical communication skills in terms of self efficacy then an interesting and meaningful learning model is used, the guided discovery learning model assisted immediate feedback. According to (Imamah, 2014; Afrida, 2015; Suphi, 2016; Ndemo, 2017) guided discovery learning is a guided discovery learning model that provides opportunities for students to actively learn and helps students find information by deduction and construction of a concept. While immediate feedback according to Lemley (2010: 14) is a feedback done to confirm students' understanding of right and wrong to be immediately clarified. So that the model guided discovery learning assisted immediate feedback is a guided discovery learning model that is followed by feedback (immediate feedback) after formative tests aimed at confirming students' true and false understanding to be immediately clarified. The advantages of the model guided discovery learning assisted immediate feedback according to Mahmoud (2014: 151) mentions that the model this very suitable for use in improving students' mathematical communication skills, self efficacy as well as being able to improve completeness in learning mathematics. The syntax of the guided discovery learning model assisted immediate feedback that is (1) Stimulation, (2) Problem Statement, (3) Data Collection, (4) Data Processing, (5) Verification, (6) Generalization, (7) Immediate Feedback.

Based of the problems above, this study aims to find patterns of mathematical communication skills in terms of self efficacy of guided discovery learning design assisted immediate feedback

METHOD

The research method used is mixed method. According to Creswell (2014) mixed method is a method that focuses oncollection, analysis, mixing of quantitative and qualitative datain a study while the research design used is sequential explanatory design. According to Clark (Subedi, 2016), the research sequential explanatory design in the first is collecting quantitative data and continuing to collect qualitative data.

Quantitative data is used to determine the effectiveness of guided discovery learning model assisted immediate feedback on mathematical communication skills. The data was obtained through tests of students' mathematical communication skills.

Qualitative data is used to analyze mathematical communication skills in terms of self efficacy. This qualitative data was obtained from a questionnaire self efficacy, observation, interview and documentation. The questionnaire used in this study aims to collect data regarding self-efficacy owned by students using a likert scale . Observations made in this study aim to obtain information about howclass conditions, attitudes and enthusiasm of students during the processlearning through guided discovery learning models assisted immediate feedback. Interviews in this study are used to obtain data directly about the ability of mathematical communication in solving mathematical problems about building space. The documentation in this study was used to collect data in the form of photographs and the results of student workto strengthen the results of observations and interviews conducted during the study.

RESULTS AND DISCUSSION

This study obtained two classes, namely the class VIIF as a control class and the class VIIG as an experimental class. The model applied in the control class is guided discovery learning while in the experimental class is guided discovery learning assisted immediate feedback. Before class action is taken, normality and homogeneity are tested previously. Normality test aims to determine the data obtained from the population whether or not normal

distribution. Based on the normality test obtained sig = 0.200 > 0.05 which means H_0 accepted or test data mathematical communication skills derived from normal distribution. Then homogeneity will be tested. Homogeneity test aims to determine the presence or absence of differences in variance between the two samples. Based on the homogeneity test obtained sig = 0.806 > 0.05 then H_0 accepted means that both groups have the same or homogeneous variance. Next, the average similarity of mathematical communication skills will be tested. The average similarity test uses a t-test that aims to determine whether same or not the average mathematical communication skills in the experimental class with the average mathematical communication skills in the control class. Based on the results of the average similarity test using SPSS is obtained sig = 0.119 > 0.05 then H_0 accepted and H_1 rejected, this means that the average mathematical communication ability of the experimental class is the same as the control class. Next, quantitative and qualitative analysis.

In quantitative analysis to determine the effectiveness of guided discovery learning models immediate feedback on the ability of mathematical communication. Guided discovery learning assisted immediate feedback said to be effective against mathematical communication skills if it meets 4 criteria, namely: (1)mathematical communication skills reach 75% completeness; (2) proportion of mathematical communication skills through guided discovery learning assisted immediate feedback better than the proportion of mathematical communication skills through guided discovery learning; (3) The average mathematical communication ability of students has exceeded BLA = 67; (4) Average mathematical communication skills of students through guided discovery learning assisted immediate feedback better than average mathematical communication skills through guided discovery learning.

The first criterion is mathematical communication skills reaching 75% completeness. To test the criteria the first one uses the due diligence test or the proportion of one party that produces z_{hitung}= 3.15. Based on the distribution table Z, the score is obtained $z_{tabel} = 1{,}64$ with a significance level of 0.05. So, $z_{hitung} \geq z_{tabel}$ it is $H_o$rejected. This means that the proportion of mathematical communication skills is more than 75% or it can be said that mathematical communication skills have reached classical learning completeness of more than 75%. Thus, it can be said that the conditions of the first effective have been fulfilled.

The second criterion of effective isproportion of mathematical communication skills through guided discovery learning assisted immediate feedback better than the proportion of mathematical communication skills through guided discovery learning. In this second effectiveness criterion a different proportion of the yield is used $z_{hitung} = 3{,}53$. Based on the distribution table Z, the score is obtained $z_{tabel} = 1{,}64$ with a significance level of 0.05. So, $z_{hitung} \geq z_{tabel}$, then H_0 is rejected. This means the proportion of mathematical communication skills go through guided discovery learning assisted immediate feedback better than the proportion of mathematical communication skills through guided discovery learning. Thus, it can be said that the conditions of the first effective have been fulfilled.

The third criterion of effective is the average mathematical communication ability of students has exceeded the Actual Passed Level (BLA) = 67.The actual pass limit is obtained from the average results of the initial communication skills test added to a quarter of the standard deviation. The third criterion uses a one-party t-test that produces $t_{hitung} = 19{,}92$. Based on the distribution table Z, the score is obtained $t_{tabel} = 1{,}68$ with a significance level of 0.05. So, $t_{hitung} \geq t_{tabel}$then $H_0$is unaccepted.This means that the average value of mathematical communication skills is more than 67. Thus, it can be said that the conditions of the first effective have been fulfilled.

The fourth criterion is the average mathematical communication skills of students through guided discovery learning assisted immediate feedback better than average mathematical communication skills through guided discovery learning. In this fourth criterion using the average

difference test that produces $t_{hitung} = 10{,}74$. Based on the distribution table Z, the score is obtained $t_{tabel} = 1{,}67$ with a significance level of 0.05. So, $t_{hitung} \geq t_{tabel}$ it is H_0 rejected. This means the average mathematical communication ability of students through guided discovery learning assisted immediate feedback more than the average mathematical communication ability of students through guided discovery learning. Thus, it can be said that the conditions of the first effective have been fulfilled.

Based on the first, second, third, and fourh criterion of quantitative data above it is known that the requirements of the effectiveness of a learning have been fulfilled so that it can be concluded that the model guided discovery learning assisted immediate feedback effectively improve mathematical communication skills in terms of students' self efficacy.

Qualitative data analysis aims to find patterns of mathematical communication skills in terms of self efficacy. The subjects in this study is 32 students of grade VIIF SMP Negeri 1 Mijen, Demak who were categorized into three self efficacy's categories of high, medium and low. Based on the results of the self efficacy questionnaire, it is found that there were 6 students with high self efficacy, 18 students with moderate self efficacy and 8 students with low self efficacy. Then from each category of self efficacy into 3 levels of students mathematical communication skills, namely low, medium and high. The following are the results of the analysis of mathematical communication skills in terms of self efficacy:

Table 1. Results of Mathematical Communication Skills in terms of Self Efficacy

No	*Self Efficacy*	Mathematical Communication Skills Number of Students	Categories
1	High	3	High
		2	Medium
		1	Low
2	Medium	8	High
		9	Medium
		1	Low
3	Low	1	High
		3	Medium
		4	Low

Based on the table above, there are 6 high self efficacy students who 3 students have high category of mathematical communication skills, 2 medium category and a student has low category. In medium self-efficacy there are 8 students who have high mathematical communication skills in the high category, 9 students in medium category and a student has in the low category. Students in low self efficacy, there are a student who has high category of mathematical communication skills, 3 students who have medium category of mathematical communication skills and 4 students who have low category of mathematical communication skills.

Students in high self efficacy and high mathematical communication skills. There are three students who are able to three indicators is making mathematical problem models and providing answers using mathematical language (written text), students can already reflect pictures into mathematical models (drawing), students can express mathematical concepts with mathematical language (mathematical expressions). Whereas in students with medium mathematical communication as many as two students only fullfill two indicators of mathematical communication skills including the second indicator (drawing), students are able to reflect pictures into mathematical models and the third indicator (mathematical expression) students can express mathematical concepts with mathematical language. While students with low mathematical

communication as much as one student only fullfill one indicator of mathematical communication skills, namely written text indicator, students can only make mathematical problem models and write down mathematical ideas. So it can be concluded that individuals who have high self efficacy do not necessarily have high mathematical communication skills.

This is not in accordance with the theory of Bandura, Hamidah research and Desmawati. Bandura explained that individuals who have high self-efficacy have high aspirations and commitment to the task. Hamidah's research results (2013) explain that a person who has high self efficacy then his mathematical communication skills are also high while according to Desmawati et al. (2015) obtained information that if students 'self-efficacy is high then students' mathematical communication skills will be high.

Students in the medium self-efficacy group showed the results that there are 8 students who have high mathematical communication skills, 9 students who have medium mathematical communication skills, and one student has low mathematical communication skills. From 8 students with high mathematical communication skills fullfill 3 indicators namely (1) written text, students can write problems into mathematical models, (2) drawing, students can reflect pictures into mathematical models, (3) mathematical expressions, students can express mathematical concepts with mathematical language. In students with the category of mathematical communication are currently only fullfill a few indicators, 4 students fullfill written text and drawing indicators and 5 students fullfill indicators of drawing and mathematical expressions. While one student who has low mathematical communication skills only fullfill one indicator, written text, students can only write problems into the mathematical model. So it can be concluded that individuals who have medium self efficacy do not necessarily have medium mathematical communication.

This is not in accordance with the theory of Bandura, Hamidah research and Desmawati. Bandura explained that individuals who have self-efficacy are having aspirations and commitments that are on duty. Hamidah's research results (2013) explained that someone who has medium self efficacy then his mathematical communication skills are also medium whereas according to Desmawati et al. (2015) obtained information that if students' self-efficacy is medium, their mathematical communication skills will be medium.

Students in the low self efficacy group showed that there were one student who has high mathematical communication skill, 3 students have medium mathematical communication skills, and 4 students who have low mathematical communication skills. Students with high mathematical communication skills as much as one student fullfill 3 mathematical indicators, namely (1) written text, students can write problems into mathematical models, (2) drawing, students can already reflect pictures into mathematical models, (3) mathematical expressions, students can express mathematical concepts with mathematical language. Students in the medium mathematical communication category as many as 3 students only fullfill two indicators is drawing and mathematical expressions. While the other 4 students in low mathematical communication skills fullfill one indicator of mathematical communication skills is written text, students can already write problems into mathematical models. So it can be concluded that individuals who have low self efficacy do not necessarily have low mathematical communication skills.

This is not in accordance with the theory of Bandura, Hamidah research and Desmawati. Bandura explained that individuals who have low self-efficacy have low aspirations and commitment to the task. Hamidah's research results (2013) explained that a person who has low self efficacy then his mathematical communication skills are also low while according to Desmawati et al. (2015) obtained information that if students 'self-efficacy is low then students' mathematical communication skills will be low

CONCLUSION

Based on the results of the study it can be concluded that a pattern that the higher the students' self efficacy, not necessarily the higher their mathematical communication skills, the more medium students' self efficacy, not necessarily the more medium mathematical communication abilities and the lower the students' self efficacy, not necessarily the lower their mathematical communication abilities.

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