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Mathematics Communication Skill Seen from *Self Efficacy* on *Project Based Learning* Model with Realistic Approach Assisted by Web - Video

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Abstract

This research aims to describe mathematics communication skill seen from *self-efficacy* on *Project Based Learning* model with realistic approach assisted by web-video. This *mixed method* research used *sequential explanatory*. The population of this research consisted of VII graders of SMP N 1 Bae Kudus, in academic year 2018/2019. The subjects were VII B students, selected based on three *self-efficacy* categories: high, moderate, and poor. The techniques of collecting data were mathematics communication skill test, *self-efficacy* questionnaire, and interview. The findings showed that learning by using PjBL model with realistic approach assisted by web video was effective. The descriptions of the skill seen from *self-efficacy* of the students within high, moderate, and poor categories on PjBL with realistic approach assisted by web – video were varied on each category. Based on 5 high *self – efficacy* students, there were 4 of them having high communication skill and 1 moderate communication skill. From 21 students with moderate *self – efficacy* showed 7 of them having high communication skill, 10 moderate communication skill, and 4 poor skill. From 6 students with poor *self-efficacy,* there were 2 students with moderate communication skill, and 4 with poor communication skill.

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INTRODUCTION

The importance of learning mathematics as symbolic language cannot be separated from mathematics skills owned by students. One of them is mathematics communication. However, in reality, students are not trained to solve complex mathematics problem which needs reasoning, mathematics calculation, and reading diagram or graphs (Adlim, Wilyta, & Hasa, 2017).

Based on preliminary study conducted at SMPN 1 Bae Kudus, the teacher had not developed mathematics skills, especially mathematics communication skill. Based on the test result, the students had not been able to solve mathematics communication problem questions.

The poor level of the students' mathematics communication skill would influence to their learning achievement. It led to their incapability in understanding mathematics ideas and in communicating the ideas into symbols, tables, diagrams, and other media. Thus, they would be unable to solve mathematics problems properly.

The students' belief and perceptions about their current learnt material is important and assumed to influence their learning achievement. In this case, it is called as *self-efficacy*. Hamdi & Abadi (2014) stated that *self – efficacy* strongly influenced learning achievement of students.

Poor level of student *self-efficacy* on mathematics is indicated by their lack of interest to try more in solving mathematics problem. They tend to give up while facing difficult task (Novfema, 2016). It should be a concern of teacher beside low learning achievement of the students. It is also important to improve student *self-efficacy* in solving mathematics problems.

Therefore, it is important to have solution to make students more active and directly participate in learning process to improve their mathematics communication skill and *self-efficacy*. One of the solutions is implementation of Project Based Learning Model to facilitate them in direct participation during learning process. According to Kokotsaki, Menzies & Wiggins (2016), PjBL as student – centered learning would make students active in learning process to achieve the objectives through social interaction and various knowledge and cognition.

Mathematics communication can be improved by PjBL supported by certain approaches. One of them is realistic approach. Realistic – mathematics learning has characteristics and principle to develop students optimally, such as habits to share opinion and to correlate contextual problem and mathematics concept to real life. This approach could be promising in learning (Zaini & Marsigit, 2014).

Another learning alternative to use is a web video, such as YouTube. It can facilitate to solve mathematics problem, to communicate, to think, and to prove. Besides that, this technology can provide chance for students to explore their mathematics ideas and support them to create good connection both inside and outside of classroom (Rimilda, 2017).

June, Yaacob, & Kheng (2014) found that web video such as YouTube could attract and improve participation and involvement of students in improving critical thinking skill. They could actively participate and showed strong interest in learning process. It could be seen from their capabilities to understand learning both in visualizing the content and connecting to the real world.

In this learning, the learning activity and real – life mathematics problem could be traced and or presented by assistance of web video, such as YouTube. Through this media, *self – efficacies* of students are developed.

Therefore, this research would implement PjBL model according to George Lucas in which there were 6 learning stages. This model was integrated into realistic approach with realistic principles in PjBL.

The model implementation was supported by web medium – YouTube. This media would be used to facilitate improving *self-efficacy* and mathematics communication skill of the students. This research aims to find out effectiveness and review deeper the mathematics communication skill and *self-efficacy* of the students.

METHOD

This *mix method* with *sequential explanatory* and quantitative approach as primary method. This research designed was *post-test control group* where there were three classes selected randomly.

The stages in this research were initiated by preliminary study. It was done by designing research, selecting the research site, gaining permission, preparing instrument, and preparing research instruments. The second stage was researching. In this stage, the process of collecting quantitative and qualitative data were done. Then, the data would be analyzed and interpreted.

This research was conducted at SMP N 1 Bae Kudus. The population consisted of VII graders in academic 2018/2019. The samples were VII A and VII B students as experimental group and VII C students as the control group. Each of the class consisted of 32 students.

The subjects of this research were VII B students. They were taught by PjBL with realistic approach assisted by web video seen from *self-efficacy.* The students were categorized into: high, moderate, and poor *self-efficacy.*

The data covered quantitative and qualitative data. The quantitative data was collected by mathematics communication skill test while the qualitative data was collected by questionnaire of *self-efficacy,* interview, and documentation.

The quantitative data analysis was done to find effectiveness of the learning model. It covered individual's minimum passing grade achievement, proportional passing grade achievement, *self-efficacy* influences, and average of variances tests toward mathematics communication skill. The qualitative data analysis was done by data reduction, data display, and data conclusion.

FINDINGS AND DISCUSSION

Based on mathematics communciation skill test analysis, it was gained individual's passing grade of the experimental group with score $sig = 0.000 < 0{,}05$. It meant the average of the experimental group students taught by PjBL with realistic approach reached minimum passing grade, 67.

The proportional test showed $z_{count} = 0.8165$ with significant level 5% and $z_{tabel} = z_{(0{,}475)}$ was 1.96. It meant that z_{count} was on $-z_{0,5(1-\alpha)} < z_{hitung} \leq z_{0,5(1-\alpha)}$. It was $-1.96 < 0.8165 < 1.96$. Thus, H_0 was accepted. Therefore, the proportion of the student passing grade taught by PjBL with realistic approach had reached minimum passing grade 75%.

Then, test of *self-efficacy* influence to mathematics communication skill on PjBL with realistic approach showed $sig = 0.000 < 5\%$. It meant *self-efficacy* influenced mathematics communication skill.

The influences between *self-efficacy* and mathematics communication was 0.391 = 39.1%. The score showed that *self-efficacy* influenced mathematics communication skill with percentage 39.1%.

On PjBL with realisitc approach assited by web video, the score of $sig = 0.000 < 0.05$. It meant that mathematics communication skill of the students taught by PjBL with realistic approach assisted by web video reached the minimum passing grade, 67.

On proportional test, it obtained $z_{count} = 1.6329$ and $z_{table} = z_{(0{,}475)}$ was 1.96. It meant that z_{count} was on $-z_{0,5(1-\alpha)} < z_{count} \leq z_{0,5(1-\alpha)}$ that was $-1{,}96 < 1{,}6329 < 1.96$. It meant H_0 was accepted. Thus, the proportion of student minimum passing grade taught by PjBL with realistic approach assisted by web video reached minimum passing grade 75%.

The influence of learning with PjBL model with realistic approach assisted by web video obtained score of $sig = 0.000 < 5\%$. It meant that there was influence of *self-efficacy* to mathematics communication skill.

The influence of *self-efficacy* to mathematics communication skill was 0.536 = 53.6%. It was in line with Rahmi, Nadia, Hasibah, & Hidayat (2017) concluding that generally *self-efficacy* influenced mathematics communication skill. There was positive correlation between *self-efficacies* to mathematics communication skill with percentage 38%.

The ANOVA test showed that sig $0.008 < 0.05$. It meant H_1 was accepted. Therefore, minimally, one average of mathematics communication skill was different. Score of class $1sig$ (taught by PjBL with realistic approach) and class 2 (taught by PjBL with realistic approach assisted by web video) was $0.266 > 0.05$. It meant the average of mathematics communication skills were equal.

Score of class 1's sig (taught by PjBL with realistic approach) with class 3 (taught by *discovery learning*) was $0.046 < 0.05$. It meant the average of the mathematics communication skill was different. *Sig* score of class 2 (taught by PjBL with realistic approach assisted by web video) and class 3 (taught by *discovery learning*) was $0.002 < 0.05$. It meant the average of the mathematics communication skill was different.

The qualitative data analysis of the subjects was taken from 32 students of VII B class. They were categorized into high, moderate, and poor *self – efficacies.* The *self – efficacy* questionnaire showed 5 out of 32 students were categorized high, 21 moderate, and 6 poor category students.

Table 1. Summary of Mathematics Communication Skill Seen from *Self - Efficacy*

NO	*Self Efficacy*	PG	
		Numbers of the students	Categories
1	High	2	High
		3	Moderate
2	Moderate	3	High
		15	Moderate
		3	Poor
3	Poor	2	Moderate
		4	Poor

Based on the analysis, there were 5 high *self – efficacy* students whom consisted of 2 high mathematics skill student, and 3 moderate skilled student. From the students, all of them met three out of four indicators of mathematics communication skill.

Dealing with *drawing* as indicator, those students could state the problems given to them into figures. They could also state what was known. Two high skilled students could write what was known while the moderate skilled student could not write what was known.

All students could meet *written text* as indicator to create conclusion with their own language. They could transform daily life problems into mathematics symbols and solved it based on *mathematical expression* indicator.

Dealing with second *written text* indicator, to create model of the situation or problem by using writing, speech, concrete, graphs, and algebra, those two high skilled students could arrange the solution model from the given problems well. Meanwhile, the other student could sufficiently create the solution model. It was due to the process of solving problem, the student with moderate mathematics communication skill was frequently miscalculating although he had correct solution model.

Students with moderate *self – efficacy* consisted of 3 high mathematics communication skill students, 15 moderate skilled, and 3 poor skilled students.

The high skilled students had met four mathematics communication indicators although *written text* indicator of creating solution model had mistakes in substituting and calculating the final result. The high skilled subjects could create sketch from the given problems into figure (*drawing*), could arrange solution model (*written text*), could change daily problems into mathematics symbols (*mathematical expressions*), and create conclusion by their own language (*written text*).

Moderate skilled students had met the indicators properly. Dealing with *drawing* as indicator, the students could create sketch from the given problems into figures they could directly state on the figure about the unknown size but they could not state it during interview.

The student category also could create solution model although it was not maximum in calculating the final result. The subjects could create conclusion with their own language and change daily life problems into mathematics

symbols although they still had mistakes in final calculation.

These moderate skilled students could not meet all four indicators of mathematics communication skills. On *drawing* indicator, there was only one subject whom was able to create sketch of the given question into figure. He could directly state the size of the known figure. On *written text* to create conclusion with their own language, the subjects were sufficiently able to conclude and write the main informative idea obtained from the calculation result.

On *written text* indicator, creating solution model and mathematical expression, to put daily life problems into mathematics symbols, there was only one student whom was able to do so.

The poor *self – efficacy* category students had 2 students with moderate mathematics communication skill and 4 with poor mathematics communication skill. The moderate typed students could meet all four indicators of mathematics communication skill.

The subjects could create sketch of the problems into figures although there was not any writing about what was known based on the question. The students directly stated the size of the known on the figure and could mention it during interview process. They also could create solution problem, write conclusion with their own language, put their daily life problems into mathematics symbols and solve it.

Students with poor *self – efficacy* could sketch the given problems into figures. They could create solution model from the given question but it was not appropriate while calculating the final result. The subjects could put their daily life problems into mathematics symbols and solve it. However, they could not write the conclusion with their own language. The design of PjBL was arranged to involve students actively in creating learning motivation and interest toward learning process. It was also purposed to improve *self – efficacy* through project activity. According to Chiang & Lee (2016), they stated that project based learning could improve interest of students in learning process and also facilitate them in solving the given problems.

PjBL with realistic approach provided students chance to improve their mathematics communication skill in solving realistic problems in their daily life by having web video assistance to show information about rectangle. Through this learning, it illustrated realistic problem occurring in daily life. It was in line with Paruntu, Sukestiyarno, & Prasetyo (2018); Afifah & Khabibah (2017), stating that project based learning model with *scaffolding* was effective for mathematics communication skill and students' responses to learning with positive project based model.

The implementation of this learning showed that PjBL with realistic approach could make mathematics communication skill reach the minimum passing grade individually and classically on rectangle material. The classical passing grade on PjBL could pass 70% while the individual passing grade could pass the minimum passing grade score (Kumalaretna & Mulyono, 2017).

The implementation of realistic approach on PjBL model could make the students more confident and enthusiasm in learning process led by the teacher. They could understand and solve the given problems, especially about rectangle. The *setting* of realistic learning could effectively develop mathematics communication skill of students (Asikin & Junaedi, 2013; Haji, 2016, Wibowo, 2017).

It was in line with the research, Hasibuan, Saragih, & Ary (2019) stated that mathematics teachers could facilitate learning with qualified learning material especially by using realistic approach.

Based on *self-efficacy* questionnaire result, it was obtained that the average of *self-efficacy* of the students were categorized into moderate category. The experimental group taught by PjBL with realistic approach assisted by web video, based on their responses from the questionnaire, showed that YouTube as learning medium facilitated learning process and functioned as project task. It was said good as seen on average of the total, 2.81, categorized well.

Based on the questionnaire result of the media, it was known that the students responded the media well. They were interested in using web video as learning media and project task as well.

Most of the students stated that it was their first time using web video, especially YouTube in mathematics learning process. Other responses revealed that the media made them interested in the learning although during the project they were several of them having difficulties. But they could make it well. It was in line with June, Yaacoob, & Kheng (2014). They showed that Video YouTube could be joyful and interesting in improving their participations and involvements during learning process.

The use of YouTube could create more interesting learning and improve the students' participations in learning (Buzzetto-More, 2014 & Buzzetto-More, 2015).

CONCLUSION

Based on the findings, it was obtained that high *self – efficacy* students did not always have high mathematics communication skill. It also happened to moderate *self – efficacy* students. They did not always have moderate mathematics communication skill. There were several of them having high and poor mathematics communication skills. However, the poor *self – efficacy* students, their mathematics communication skills were considered moderate.

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