



Mathematics Connections Based on Self Regulated Learning Through Project Based Learning with Ethnomathematics Nuances and Independent learning with assisted of Module and Whatsapp

Ika Ariwanti Fathonah [✉], Scolastika Mariani, Sukestiyarno

Universitas Negeri Semarang, Indonesia

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Abstrak

The study aims to describe the mathematical connections ability in project based learning nuanced ethnomatematic and independent learning module-assisted and whatsapp in terms of self-regulated learning. This study uses a mixed method with explanatory sequential design. Subjects of this study were 7th grade students of SMP Negeri 1 Bae Kudus 2018/2019 school year. The subjects in this study were students of class VIIF and VIIG selected based on three categories of self regulated learning, namely high, medium, and low. Data collection techniques using tests of students' mathematical connection ability, self regulated learning questionnaire, observation of self regulated learning and interviews. The results showed that the project-based learning nuanced ethnomatematics and independent learning with modules and whatsapp was effective against mathematical connection ability, and the description of the ability of mathematical connections in terms of self regulated learning in the high, medium, and low learning in the project-based learning nuanced ethnomatematics and independent learning with modules and whatsapp gets varied results.

[✉]Correspondence:
Kampus Pascasarjana Unnes, Jl. Kelud Utara III Semarang 50237,
Indonesia
E-mail: ikaariwantifathonah@gmail.com

INTRODUCTION

The ability of mathematical connections is very important that every student has. This ability is important for students because mathematics consists of various concepts and procedures that are interconnected, even concepts in mathematics construct other concepts (Afrizal & Dachlan, 2017; Supriadi, 2015). According to (Badjeber, R & Siti Fatimah, 2015; Siregar & Surya, 2017; Afifah, 2017) in learning a new concept, a student needs prior experience and knowledge related to the concept to be discussed.

In addition to students' mathematical connection ability, self regulated learning is also a component in mathematics learning that must be improved. According to (Setiawan, et al, 2017; Arifin & Tatang, 2018) good self regulated learning students enables student learning outcomes to be good because with self regulated learning students are motivated to learn on their own volition. If students have the self regulated learning then this will foster a positive attitude to students. This positive attitude according to Fajri, et al (2016) can be seen from the seriousness of following the lesson, completing assignments well, participating actively during learning, completing tasks thoroughly and on time, and responding well to the challenges given by the teacher.

The results of the preliminary study turned out to be a matter of not using a mathematical connection indicator. Based on the test results found that students have not been able to write the concepts used in solving given problems.

In this research independent learning will be applied. According to Putra, et al. (2017) independent learning can be done in the classroom or in the classroom environment both individual and group in nature and also requires limited assistance to be more focused and orderly in carrying out its activities.

The use of modules will assist students in learning the material to be learned. This is reinforced by the results of Primary, et al (2016) research showing that the influence of the use of modules on independence was 60.22% based on observational data, and 47.61% based on questionnaire data. Modules that will be made for this research will be given ethnomatematics elements, so students will be more interested in participating in learning.

The development of Information Technology that is increasingly rapid in the current era of globalization can not be avoided anymore influence on the world of education (Budiman, H, 2017). The use of whatsapp media supports the student's independent learning process. According to Widyanto, et al. (2018) by using whatsapp as a learning medium, interaction between educators and students is no longer limited in class meetings but can also occur outside the classroom.

The use of Whatsapp instant messaging can help students in learning mathematics. The use of Whatsapp instant messaging as a tool to foster a social constructivist environment for learning mathematics (Jumiatmoko, 2016; Yuwono & Muhammad Wahid, 2017; Naidoo & Kopung, 2016). Based on the results of research Winardi & Wardono (2017) shows that students who obtain the Missouri Mathematic Project learning with an open-ended approach assisted by whatsapp have self regulated learning students and good learning achievement.

Learning is carried out in experimental class 2 using independent learning with module and whatsapp. Learning activities carried out for 3 weeks with details 5 × face to face for assistance and the rest of the independent learning outside the classroom. The independent learning steps adopted from the learning steps according to Ering, et al (2017) SDL model developed by Knowles (1975) and perfected by Song & Hill (2007) consist of planning, monitoring and evaluating and combined with and mentoring learning according to Putra, Riza et al. (2017) there are 3 steps of independent learning: 1) Planning Phase 2) Implementation Phase 3) Evaluation Phase.

In addition to using independent learning, this research will also apply a project-based learning model with nuances of ethno-mathematics. Learning with PjBL, the teacher is responsible for monitoring student activities while completing projects, so students are able to develop ideas and produce satisfying results (Rahmazatullaili, 2017; Fitriana, et al, 2016). According to the results of Kurniawan's research, et all (2018) in Class A that applies the PjBL learning model, each group is given the freedom to design the project being carried out, but still refers to the criteria or stages that have been determined. Based on this, PjBL learning can foster student learning independence

In this research, project based learning and ethnomatematics will be combined with learning models to make learning more interesting. Ethnomatematics is an approach that can be used to explain the reality of the relationship between environmental culture and mathematics as a family of knowledge (Putri, 2017). The core step of the learning model refers to the steps of the learning model proposed by Annafi & Sry Agustina (2018), namely determining the problem, concept analysis, project design planning, preparation of work, presentation, evaluation of experience. The learning model steps is then modified so as to produce a new learning step.

Based on this, the researcher wants to conduct research to find out the effectiveness of the ethnomatematics project-based learning model and independent learning with modules and whatsapp and examine more deeply how students' mathematical connection abilities are seen in terms of self regulated learning students.

METHOD

This study used is mixed method with an explanatory sequential design. The population in this study were students of class VII SMP Negeri 1 Bae Kudus in the academic year 2018-2019, and the sample in this study was class VII F as an experimental class 1, class VII G as an experimental class 2 and VII H as the selected control class using a cluster random sampling technique.

The data used in this study are the data of the mathematical connection ability test, self regulated learning students questionnaire data, self regulated learning observation data and the interview data. Connection test results were analyzed to determine the effectiveness of project-based learning nuanced ethnomatematics and independent learning with module and whatsapp. Quantitative data analysis technique is the effectiveness test which includes the classical completeness test, the effect test of the average difference test of the three classes using the Anova test.

As for qualitative data analyzed using four steps, namely data validity, data reduction, data presentation and conclusion drawing. Test the validity of the data on the credibility of the data using triangulation techniques in which data testing is done by checking the data at the same source but with different techniques namely tests and interviews.

Thorough research is conducted to describe to self regulated learning students based on each category. The subjects of this study were 32 students in class VII F and VII G of SMP Negeri 1 Bae Kudus, respectively which were classified into three categories: high, medium, and self regulated learning low.

After the research subjects are determined, then the next description of the analysis of students' mathematical connection ability in terms of the self regulated learning students with high, medium, and low categories is presented in the following table:

Table 1. Summary of Mathematical Connection Abilities in Terms of self regulated learning Experiments 1

No	Self Regulated Learning	Mathematical Connection Ability	
		Total Students	Category
1	High	2	High
		0	Medium
		0	Low
2	Medium	7	High
		15	Medium
		3	Low
3	Low	0	High
		2	Medium
		3	Low

Table 2. Summary of Mathematical Connection Abilities in Terms of self regulated learning Experiments 2

No	Self Regulated Learning	Mathematical Connection Ability	
		Total Students	Category
1	High	2	High
		1	Medium
		0	Low
2	Medium	3	High
		17	Medium
		3	Low
3	Low	2	High
		2	Medium
		2	Low

RESULT AND DISCUSSION

The results of the analysis of the effectiveness of independent learning with module and whatsapp on mathematical connections indicate that the results of the calculation of individual completeness tests indicate that $sig = 0.013 = 1.3\% < 5\%$. So it can be concluded that the average of students who were given independent learning by module and whatsapp reached KKM that is 69. Completeness test proportion obtained z_{hitung} value was 0.816 for the significant level (α) 5% obtained $z_{0.475}$ value was 1.96. Because the value of z_{hitung} is $-1.96 < 0.816 < 1.96$ then $-z_{(0.5(1-\alpha))} < z_{hitung} \leq z_{(0.5(1-\alpha))}$ means that H_0 is accepted. So, the proportion of students who obtained independent learning with module and whatsapp had achieved mastery equal to 75%.

Next to test the effect of self regulated learning on the ability of mathematical connections in module-assisted independent learning classes and whatsapp obtained $sig = 0,000$. It is clear that $sig < 5\%$, then H_0 is rejected and accepts H_1 . So it can be concluded that there is an influence between self regulated learning with students' mathematical connection abilities. The magnitude of influence obtained $0.438 = 43.8\%$. This value indicates that the variable of student self regulated learning affects the ability of students' mathematical connections by 43.8%.

In learning project based learning nuanced ethnomatematics shows the results of individual completeness test shows that $sig = 0.00 = 0\% <$

5%. So, it can be concluded that the average student who was given project-based learning nuanced ethnomatematics reached KKM that is 69. Completeness test the proportion obtained z_{hitung} was 1.633 for a significant level (α) 5% obtained $z_{0.475}$ value was 1.96. Because the value of z_{hitung} is $-1.96 < 1.633 < 1.96$ then $-z_{(0.5(1-\alpha))} < z_{hitung} \leq z_{(0.5(1-\alpha))}$, it means that H_0 is accepted. So, the proportion of students who obtained module-assisted independent learning and whatsapp had achieved mastery equal to 75%.

Whereas in the class learning project based on nuances of ethnomatematics obtained $sig = 0,000$. It is clear that $sig < 5\%$, then H_0 is rejected and accepts H_1 . So it can be concluded that there is an influence between self regulated learning with students mathematical connection abilities. The magnitude of influence obtained $0.654 = 65.4\%$.

Anova test shows that the value of $sig 0,001 = 0\% < 5\%$ then H_0 is rejected or accepts H_1 . So, at least one of the mathematical connection abilities is different. The sig value in class 1 (ethnomatematics nuanced project-based learning) and class 2 (independent learning with module and whatsapp) is $0.069 > 0.05$, which means that the average mathematical connection ability is the same. The sig value in class 1 (ethnomatematics nuanced project based learning) and class 3 (control class using discovery learning) is $0.00 < 0.05$, which means that the average ability of mathematical connections is different. The sig value in class 2 (independent learning with module and whatsapp) and class 3 (control class using discovery learning) is $0.40 <$

0.05 which means that the average ability of mathematical connections is different. In the table the value of sig can be seen the comparison between the two different classes is the experimental class 1 with the control class and the experimental class 2 with the control class. The grade 1 grade (ethnomatematics based project learning) is 79.38, which shows the highest average mathematical connection ability among others. So the class with project-based learning nuanced ethnomatematics produces the best mathematical connection ability.

In this study, self regulated learning is grouped into 3 groups, namely high, medium, and low self regulated learning. Based on the results of the analysis, in experimental class 1 it was found that from 2 students with high self regulated learning there were 2 students who had high mathematical connection abilities, while there were no students who had medium and low connection abilities, from both students in the category, both of them could meets all three indicators of mathematical connection ability. Students are able to write down what information is known and asked according to what is in the problem, students are also able to draw the sketch requested in accordance with the illustration of the problem, and students are able to answer the problem using concepts that are appropriate to the problem. Students with high self regulated learning can achieve better results compared to students who have self regulated learning low (Kurniawati, et al., 2015).

The group of students who have self regulated learning who are on mathematical connection ability shows the results that there are 7 students who have high connection ability, while students who have moderate connection ability are 15 students and students who have low mathematical connection ability are 3 students. In groups of students with high connection ability, several indicators of mathematical connections can already be mastered by students well. In students with connection ability medium categories, students are able to write answers coherently from writing what is known to writing the concepts used to solve the problem. In students with low mathematical connection categories students both write incorrect formulas, so the final result is wrong. This is in line with Wulandari & Kumaidi (2015: 109) which states that the main cause of

concept errors in geometry and measurement material is not applying the formulas, concepts or properties of flat shapes or building spaces properly.

In students with self regulated learning low, it is known that students who have high connection abilities do not exist, but for students who have medium connections as many as 2 students and students who have low connection abilities are 3 students. Students on low self regulated learning show that students who have medium mathematical connection ability, students are able to write down the information contained in the problems, draw sketches and write down what formulas are used in problem solving. For students with low connections, the student has written the correct results but the steps are not coherent so it is difficult to understand and do not complete the answer until the final step.

Based on the results of the analysis, in the experimental class 2 it was found that out of 3 students with high self regulated learning there were 2 students who had high mathematical connection ability, while students who had medium connection ability were 1 student and students who had low mathematical connection ability is not exist. Both students in the high category can both fulfill all three indicators of mathematical connection ability. Whereas 1 student with connection ability was not careful enough in working on the problems so there was still something wrong in the calculation.

The group of students who have self regulated learning is showing the results that there are 3 students who have high connection ability, students who have medium connection ability as many as 17 students and students who have low mathematical connection ability as many as 3 students. In groups of students with high connection ability, several indicators of mathematical connections can already be mastered by students well. In students with connection ability medium categories, students are able to write answers coherently from writing what is known, but do not write the formula correctly. In students with a category of low mathematical connections that are not correct in solving the given problem. The subject wrote down its properties but the work did not reach the final step.

In students with self regulated learning low, it is known that students who have high connection ability are 2 students, students who have moderate

connection ability are 2 students and students who have low connection ability are 2 students. Students on low learning independence show that students who have high mathematical connection ability can already identify problems according to indicators of mathematical connection ability, but the completion stage is not coherent and incomplete. Students who have medium mathematical connection ability, students have written down the information contained in the problems, draw sketches and write down what formulas are used in problem solving. In students with low connection ability all students' answers are not resolved and on average only correct in writing is known and asked. According to Ricky, et al (2019) with the use of the media, teachers can also monitor and assist students in learning outside the classroom. Independent learning also makes students not dependent on others and has their own learning initiatives, because students must study the material themselves according to the teacher's directions using prepared modules.

CONCLUSION

The conclusions of this study are the findings with high self regulated learning patterns that are not in accordance with high connection ability, students with medium self regulated learning also have low mathematical connection ability and students with low self regulated learning providing high mathematical connection ability

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