



Problem-Solving Skill Based on Learning Independence Through Assistance in Independent Learning with Entrepreneurial-nuanced Modules

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Abstract

This study aimed to describe the ability of problem solving in terms of the students' learning independence with module-assisted independent learning. This research was conducted at MTs Negeri 1 Kudus 2019/2020 school year. The type of research used mix methods with concurrent embedded. The research data was taken by using questionnaire, observation, and test then processed by completeness test, comparative test, influence test, and improvement test. The results showed that the problem-solving ability was influenced by the students' learning independence. So independent learning by assisting students was able to make them to be more mature in science.

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INTRODUCTION

According to Kemdikbud (2016) one form of ongoing international assessment is PISA (Program for International Students Assessment) initiated by OECD (Organization for Economic Co-operation and Development) to evaluate the education system of 72 countries worldwide. PISA is conducted every 3 years with the subject of assessment is students who are 15 years of age and the objects of assessment are reading literacy, mathematics literacy, problem solving literacy and science literacy and the latest additions regarding financial literacy (OECD, 2012).

Since taking part in the PISA assessment in 2000, the mathematics scores of Indonesian students rose from 2003 to 2015, from a score of 360 to 386. However, in 2018 the score dropped to 379. This value was below China and Singapore which had high rank for math scores with the scores 591 and 569. It was influenced by the low ability of students in problem solving.

The issue of problem solving skill also occurs in MTs Negeri 1 Kudus, it is the best State Islamic Junior High School in Kudus, which emphasizes religious education and science education. According to the Education Assessment Center data stated that the results of the 2017/2018 National Examination of sets material in mathematics subject, the percentage of students who answered correctly was less than 50%. It shows that the students' problem solving skill are still lacking.

Problem solving is a planned process that must be carried out in order to get a certain solution of a problem that might not be obtained immediately (Sa'ad and Ghani, 2008). Polya (1973) defines problem solving as an attempt to find a way out of a difficulty. According to Polya, there are four steps that must be taken to solve a problem, those are (1) understanding the problem, (2) planning a solution, (3) implementing the plan, (4) checking the process and results.

Besides students' problem solving skill, learning independence really needs to be improved so that the students can solve problems and not depend on the teacher. According to Elfira (2013), in this global era, independence becomes something that needs to be observed and considered. Not being independent will give impact in low student motivation, inability to make decisions and low value of learning outcomes.

Based on the results of interviews with mathematics teachers, it is known that some students still depend on the teacher in learning process, so that the independent learning is not created. Students' awareness of independent learning initiatives and finding their own learning resources is also still low.

To obtain satisfying results and set learning objectives can be achieved related to the problems, therefore, the assistance activities are carried out in independent learning.

According to Astawan (2010) said that independent learning causes students to have the initiative, with or without the help of others, to analyze their own learning needs, formulate their own learning goals, identify learning resources, choose and implement appropriate learning strategies and evaluate their own learning achievements. In this study, researchers used entrepreneurial-nuanced modules as the students' learning source. In addition, the researchers also invited students to make observations in the cafeteria and school cooperative as a step to create a sense of students' initiative in learning.

According to Knowles (1975), self-directed learning (self directed learning) is a process where individuals are fully responsible and take the initiative in diagnosing learning needs, formulating learning goals, identifying learning resources, selecting and implementing learning strategies and evaluating learning outcomes. However, in the process of independent learning students need the assistance by the teacher so that learning is more directed and well controlled.

Indicators of learning independence in this study used indicators which is proposed by Yoseva in Hendriana, et al (2017), those are: (1) learning initiatives; (2) diagnosing learning needs; (3) setting learning goals; (4) selecting and using sources; (5) choosing and setting a strategy; (6) independent learning; (7) cooperating with others; (8) self control.

In Budiningsih (2005), Vygotsky's theory says that in learning activities children should have ample opportunities to develop their zone of proximal development or potential through learning and developing. Teachers need to provide various types and levels of helping (cognitive scaffolding) that can facilitate children so they can solve the problems they face. In this study, the teacher provided assistance by providing entrepreneurial nuances modules containing set material.

The module was chosen as an independent learning media because according to Dharma (2008: 3) the module is a printed teaching material that is designed to be studied independently by learning participants and the module is also called the media for independent learning because it has been equipped with instructions for self-study. The set material that is packaged in entrepreneurial nuances can create a pleasant and memorable learning atmosphere. Moreover, the entrepreneurial-nuanced modules are written in an interesting, colorful, and contain contextual issues. So that it can encourage students' interest to study mathematics set material.

Modules are created in an entrepreneurial-nuanced, because according to Agus Martowardojo in Kasali (2010), said that to be a developed country, Indonesia needs many reliable entrepreneurs. At present, the ratio of the entrepreneurs numbers to the total population is very less because it is still below 2%. To increase the presentation, it needs participation and synergy from the Government of Community Business Education.

According to the Ministry of National Center for Curriculum Research and Development (2010) entrepreneurship is an attitude held by students which includes the values of entrepreneurial spirit and entrepreneurial skills. Among these values are independent, creative, action-oriented, never give up, discipline, work together, responsibility, and have a strong motivation for success. And entrepreneurial skills include fond of saving, good at managing finances, having innovative thinking, identifying business opportunities, planning a business, and opening a new business with his group.

The entrepreneurial mathematics modules are designed attractively as a student's independent learning media so students are motivated to learn independently. If there are students who are motivated to learn independently then the independence of students' learning will increase. And through assistance by the teacher both in the classroom and outside the classroom with observations, student questionnaire independence, and interviews between teachers and students, the teacher can control students well so that learning outcomes in the form of students' problem solving skill can be achieved.

According to Pratama (2016), the use of contextual modules to invite students to see events around them so that students' curiosity arises. This curiosity underlies practicum activities. The results of

the practicum are used as a bridge in understanding theoretical concepts. The level of understanding the material in the module and it can be measured by assessments that exist in the module. In order to create an independent learning to improve problem solving skills based on student independence, the teacher provides a contextual mathematics module in this case a nuanced module of entrepreneurship so that students can easily learn independently.

Modules with set material packaged in entrepreneurial nuanced can create a fun and memorable learning atmosphere. Moreover, the entrepreneurial nuanced modules are written in an interesting, colorful, and contain contextual issues. So that it can encourage students' interest to study mathematics set material. In the independent learning process, students were accompanied by the teacher through observation, interviews and questionnaires so that learning is more directed and well-controlled so that learning outcomes can be achieved well.

Based on the previous description, the formulation of the problem in this study was how the description of students' problem solving skill based on student learning independence through independent learning assisted with entrepreneurial-nuanced modules.

METHODS

This research used a mixed research methods (quantitative and qualitative method). According to Creswell (2013), a combination research method is a study that combines quantitative and qualitative forms that involve philosophical assumptions. Application of qualitative and quantitative approaches by combining two approaches in a research. The combination model used in this research is concurrent embedded type strategy. This strategy can be characterized as a mixed method strategy that applies the stages of quantitative and qualitative data collection at one time.

This research was conducted at MTs Negeri 1 Kudus in the odd semester of 7th grade with set material. Class 7-D as an experimental class that was assisted by using module-assisted independent learning and class 7-I as a control class that used cooperative learning. The variables in this study were the problem solving skills and learning independence. The research data collection technique was carried out with a test of problem solving skills. Mathematical problem-solving skill tests were conducted twice,

before the research (pretest) and after the research (posttest). Meanwhile, to measure the students' independence learning was carried out by using observation and interview sheets.

Data analysis techniques on the students' problem solving skills in the experimental class and the control class used prerequisite tests, they were normality test, homogeneity test, and average similarity test. While the analysis of hypothesis testing used data on the skills to solve the final problem, including testing the proportion of students completeness, testing the average difference between the control class and the experimental class, testing the effect of assisting in independent learning with student learning independence, and increasing student independence learning test.

RESULTS AND DISCUSSION

The results of data analysis showed that both samples came from populations with normal distribution, homogeneous variants, and no significant mean differences. Thus, both samples had the same conditions. In general, the condition of students' mathematical problem solving skill was still low.

Based on these results, it is known that students have tried to answer the questions well but the steps to solve the problem are not appropriate according to Polya. Most students answered the questions with a short answer. A small number of students answered with a number of steps to solve the problem but incomplete. According to the results of the interview, most of the students were accustomed to answering questions with short answers, including answering math problem solving question which the teacher usually asked for a long description.

In addition, students' learning independence was also low. It is indicated by the results of the student learning independence questionnaire before being given the independent learning assisted with entrepreneurship-nuanced module. The results of the questionnaire showed that the average questionnaire score ranged from 62 out of 120, if it is averaged, the most likely students answered 2 out of a maximum score of 4.

Furthermore, after assisting the independent learning assisted with the entrepreneurial-nuanced module implemented in the experimental class, students were given a post-test so that the final data regarding the students' problem solving skill was

obtained. Based on the post-test results obtained data as follows.

In the minimal completeness test of the experimental class using the one sample T-test using SPSS obtained sig = 0,000 < 5%. Because the sig value < 5%, then H_0 was rejected and H_1 was accepted. It means that the average value of students' completeness given through independent learning assisted with entrepreneurial-nuanced modules has reached KKM.

In the proportion test obtained that students who reached KKM were 27 students, from the number of students in the experimental class as many as 30 students. Therefore the data obtained $z_{\text{count}} = 2.4$. Value of $Z_{\frac{1}{2}(1-\alpha)} = Z_{\frac{1}{2}(1-0,05)} = Z_{0,475} = 1,96$. Because value of $z = 2,4 > z = 1,96$, H_0 was rejected. It means that the proportion of students completeness of the experimental class with assistance in the independent learning assisted with entrepreneurial-nuanced modules is more than 75%; that is 86.67%.

In the one way ANOVA test that is used to test the difference of average problem solving skill in the classroom through independent learning assisted with entrepreneurial-nuanced modules with cooperative learning can be seen in Table 1.

Table 1. Output One Way Anova Test Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5443.538	1	5443.538	98.127	.000
Within Groups	3217.508	58	55.474		
Total	8661.046	59			

Based on the presentations in Table 1 obtained $F_{\text{count}} = 98,127$. Obtained F_{table} with degrees of freedom $\alpha = 5\%$, **dk** numerator 1 dan **dk** denominator 58 are 4,01. Based on testing criteria, because $F_{\text{count}} \geq F_{\text{table}}$. It means that there are differences in the average problem solving skills of students who are given assistance in independent learning assisted with entrepreneurial-nuanced modules with cooperative learning.

The average value of the problem solving skills of students who were given assistance in independent learning assisted with entrepreneurial-nuanced modules is 80.17. While the average value of the problem solving ability of students who were given cooperative learning is 71.

Regression test was conducted to see the effect of learning independence on the problem-solving skills of the class given through independent learning assisted with entrepreneurial-nuanced modules. The results of this regression test can be seen in the following Table 2.

Table 2. Regression Test Results

Class	B	Std. error	Beta	t	sig
Experi- ment	16.782	11.591		1.448	0.159
	0.831	0.150	0.724	5.546	0.000

Based on table 2 above obtained $\text{sig} = 0,000 = 0\% < 5\%$. Because the value of $\text{sig} < 5\%$, then H_0 was rejected and H_1 was accepted. It means that there is an influence between the characters of independence with the skill to solve problems in classes that were given assistance through independent learning with entrepreneurial-nuanced modules.

The regression line equation can be stated in the following equation: $Y = 16.782 + 0.831X$ The equation shows that the value of learning independence coefficient is 0.831 which means that if the value of learning independence increases by one unit, the value of the ability to solve mathematical problems in the material set will increase 83.1% .

Furthermore, in the increase test, the results of the calculation of the gain index obtained that in the experimental class, the students who are given independent learning assisted with entrepreneurial-nuanced modules as much as 100% of students have increased.

With details 2 students experienced a low increase, 23 students experienced a moderate increase, and 3 students experienced a high increase. In a more in-depth interview mentioned that the success was formed because of the spirit of independent learning through modules.

Entrepreneurial-nuanced modules that are produced in this study fulfill valid, practical and effective criteria. It has a valid criterion value of 4.29 (maximum score of 5.0) and a practical percentage value of 88.42%. The assessment is measured based on the concept of the set material, the character of the entrepreneurial spirit, appearance, readability and usability.

The contents of the module contain the growth of entrepreneurial spirit character and various kinds of problems in daily life that encourage students' interest

in independent learning. According to Majid (2006) the module is a book arranged systematically with the aim that students can study independently without or with the guidance of the teacher. Modules as a complement to independent learning can lead to independent students arranged to learn problem solving skills. Then the learning difficulties experienced by students are solved through mentoring so that independent learning is more directed and well controlled.

Problem Solving Skill

To analyze mathematical problem solving skills, tests of problem solving skills and interviews were conducted. The problem solving skills test was conducted after the students were given assistance in module-assisted independent learning. While interviews were conducted on six research subjects, those were 2 students with high learning independence, 2 students with moderate learning independence, and 2 students with low learning independence.

The problem-solving skills analyzed includes four problem-solving steps according to Polya, those are understanding the problem, planning the problem solving, carrying out the problem solving plan, and checking the answers again and making conclusions.

In students with high learning independence, students are very good at understanding problems, planning problem solving and implementing the problem plan. They are also very good in checking the answers and making conclusions. Previously, students often answered with short answers or accompanied by how to solve problems without using Polya steps. Then after being given this learning, students understand the steps according to Polya in solving mathematical problems.

In group of students with moderate learning independence, they are good in understanding problems, planning problem solving, and implementing problem plans students. They are also good in checking the answers and making conclusions. Previously, students often answered with short answers or accompanied by how to solve problems without using Polya steps as well. Then after being given this learning, students understand the steps according to Polya in solving mathematical problems. However, there was not enough time for these group to check the answers due to the lack of time.

In groups of students with low learning independence, students are quite good at understanding problems, planning problem solving, and implementing problem plans. They are also quite good in checking the answers back and making conclusions. Previously, the students often answered with short answers or accompanied by how to solve problems without using Polya steps as well. Then after being given this learning, students understand the steps according to Polya in solving mathematical problems. However, this low-level student did not have enough time to double-check the answers due to lack of time and there were still some incomplete steps to complete.

Based on the results of mathematics problem solving skills test analysis for 7th grade students of MTs Negeri 1 Kudus stated that there is relationship between students' learning independence and mathematical problem solving skills. Students with high learning independence are categorized very good in problem solving skills, students with moderate learning independence are categorized good in problem solving skills, and students with low learning independence are categorized quite good in problem solving skills.

However, there are a some students with high learning independence who have moderate problem solving skills. There are also students with moderate learning independence who have high and moderate problem solving skills. And there are also some students with low learning independence who have moderate and low problem solving skills. It is influenced by learning activities, intelligence abilities, and different environments.

Many students stated that they don't like mathematics because it is difficult to solve the problems, but students will be happy if they can solve problems. Therefore, assistance efforts are needed in independent learning so that students motivate to learn mathematics and want to practice solving their own mathematics problems so that problem solving skills can be increased.

It is suitable with Vygotsky's theory which says that in learning activities children should have ample opportunity to develop their zone of proximal development or potential through learning and developing. Teachers need to provide various types and levels of help (helping / cognitive scaffolding) that can facilitate children so they can solve the problems they face.

CONCLUSION

Based on these studies it was found that students' problem solving skills are influenced by students' learning independence. Students with high learning independence have excellent problem solving skills by fulfilling Polya's four steps in solving mathematical problems. Students with moderate learning independence are good in problem solving skills. And students with low learning independence are quite good in problem solving skills although some of them get incomplete grades below Minimum Completeness Criteria. So independent learning assisted is able to bring students more mature in science.

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