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Problem Solving Ability Reviewed from Independent Learning at Social Media based Blended Learning

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Abstract

This research aims to analyze the problem-solving ability of learners reviewed from their independent learning ability in blended learning assisted by social media. The population of this research consisted of X grade of Public Senior High School 6 Semarang Municipality, in the academic year 2019/2020. The sample was selected by random cluster sampling. The sample groups were X Science 1 as the experimental group while X Science 4 as the control group. This research is mixed-method research. The techniques of collecting quantitative data were the creative thinking ability test and the independent learning ability questionnaire. The technique of collecting qualitative data was done by interview based on the independent learning ability questionnaire and the problem-solving ability test result. The data was processed by a z-test, one-sample t-test, and an independent t-test. The findings showed that the problem-solving ability was reviewed by the independent learning ability realized into high, moderate, and low variety categories. It was shown by 6 students with high independent learning ability had 3 students with excellent problem-solving ability and 3 students with fair problem-solving ability. From 24 students with moderate independent learning ability, there were 10 students with excellent problem-solving abilitys, 12 students with fair problem-solving abilitys, and 3 students with low problem-solving abilitys. From 6 students with low independent learning ability, 1 student had excellent problem-solving abilitys, 3 students with fair problem-solving abilitys, and 2 students with sufficient problem-solving abilitys.

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INTRODUCTION

Problem-solving ability is an important ability to master by learners. Zaenuri (2020) states that learners have to master critical, creative, innovative, and problem-solving abilitys to compete in this 21st century. Problem-solving is one of the five process standards stated by NCTM (National Council of Teacher of Mathematics) in 2000 besides mathematics communication, connection, reason, and representation (Bahri, 2018).

Anggraeni & Herdiman (2018), Febriyanti & Irawan (2017) state that problem-solving ability is a solving process strategy upon something by using excellent and accurate procedures to solve it. Problem-solving requires learners to process and develop knowledge. It allows them to work in various processes and concepts (Lestari, 2017).

Problem-solving ability is done based on the Polya stages. They are (1) understanding the problems, (2) creating a solution plan, (3) implementing the plan, and (4) rechecking. Meanwhile, the applied Indicators are based on NTCM (2003). They are (1) implementing and adopting the accurate types of strategy to solve the problems, (2) solving the problems mathematically by involving another mathematics context, (3) constructing the new mathematics knowledge by solving problems, and (4) observing and reflecting the mathematics problem-solving process.

There are several influential factors for problem-solving abilitys. One of them is mathematics independent learning ability (Supriatna et al, 2019). Autonomy is a condition or matter in which an individual does not depend on other individuals. According to Desmita (2009), autonomy is a ability to control and manage thought, affection, and the action independently and to struggle to overcome any embarrassment or doubt.

Independent learning ability is a process that allows learners to control and manage their thought, behavior, and affection. Thus, it could make them succeed in their learning experience (Shanon et al, 2011 quoted from Masriah, Sukestiyarno, & Susilo, 2015). Adopting from Yosefa (2009) in Novalita, H & Noer, S.H. (2019), the indicators of independent learning ability are defined as: a) learning initiation, b) diagnosing the learning necessity, c) determining the learning objective, d) selecting and using the learning source, 3) selecting and determining the learning strategy, f) learning independent, g) cooperating with others, and h) having self-control.

The success of problem-solving, reviewed from the independent learning ability, will be successful when it is supported by excellent learning. Zaenuri (2020) states that excellent learning is learning that could explore the learners. Thus, by selecting the accurate model or learning method, it could improve the learners' achievements.

The present trend of learning is that learning could be carried out anywhere, anytime, anyone, and by any means (Aslamiyah et al, 2019). Thus, in this research, the learning was chosen to be held in the class, face to face; and at home, online. The combination of direct and online learning is called blended learning. Moebs and Weibelzahl (in Hussamah, 2014) define blended learning as a combination of online and face-to-face methods in an integrated learning activity.

Blended learning has several models, one of them is a flipped classroom model and it was applied in this research. Bishop & Verleger (2013) argues that a flipped classroom is a student-centered learning model. It consists of two components. They are direct-outdoor classroom by using learning video, and group or interactive group learning in the classroom.

In this research, the learning was done face-to-face by implementing a problem-based learning model with real-life problems. It is in line with Nurhasanah (2009) in Sumartini, T. S. (2016) that Problem Based Learning is a learning model that applies a real-life problem as a context for students to learn about how to think critically and problem-solving ability as well as to obtain essential concept and knowledge from the lesson materials. On another hand, online learning was assisted by the use of social media.

The problem formulation is how the learners' problem-solving abilitys reviewed from the learner autonomy are during the blended learning

assisted by social media. This research aims to analyze the problem-solving ability of learners reviewed from their independent learning ability in blended learning assisted by social media.

METHOD

The applied learning method is a mixed-method, combining quantitative and qualitative researches. In the first stage, the data were collected and analyzed quantitatively. Then, it was followed by collecting and analyzing the data qualitatively that were constructed from the initial quantitative data results.

The research was carried out in Public Senior High School 6, Semarang during the even semester, in the academic year of 2019/2020. The population in this research consisted of the X graders of the academic year 2019/2020. The sample consisted of two tenth grade classes. The subjects were selected from the experimental group based on the independent learning ability questionnaire results that were classified into three categories: high, moderate, and low. In another hand, the problem-solving ability is classified into five groups. They are extremely excellent, fair, sufficient, low, and poor. The subjects of the high independent learning ability group were selected from two learners with excellent category and fair category of problem-solving abilitys. The subjects of the moderate independent learning ability group were selected from two learners with excellent category and sufficient category of problem-solving abilitys. The subjects of the low independent learning ability group were selected from two learners with excellent category and fair category of problem-solving abilitys.

The quantitative data were obtained from the problem-solving ability test of the learners. The test was done twice at the beginning (pretest) by using the materials about vector definition and vector operation, and the final test (post-test) with the materials about vector position, comparison of vector, and collinearity of vectors. In another hand, the qualitative data were obtained from observation, questionnaires, and interviews.

The quantitative data test used normality, homogeneity, classical completeness, proportional comparison, and variance comparison tests. The applied qualitative data analysis consisted of data reduction, display, and conclusion.

RESULT AND DISCUSSION

In this research, there were two classes: X Science 4 as a control group and X Science 1 as an experimental group. The applied model for the control group was problem-based learning while the experimental group was intervened by the blended learning assisted by social media.

Before promoting the lesson, voting was carried out to determine what social media would be used. The voting showed all of the learners, 100%, chose WhatsApp. Finally, it was agreed that online learning from home was carried out by using WhatsApp. It is in line with a study conducted by Faridh (2019). He states that flipped classroom learning based on WhatsApp module consisted of both outdoor and indoor classroom that supports the learners to be literate, active, and autonomous. Those are important for the autonomy and mathematics literacy development of learners.

Before intervening, the tests of the requirement of the data were conducted. They were normality, homogeneity, and average of variance tests. The normality test was purposed to find out whether the data were normally distributed or not. Based on the test, it was obtained $\text{sig} = 0{,}054 > 0{,}05$, meaning that H_0 accepted both group samples were normally distributed. The next step was conducted on the homogeneity test. It had the purpose to find out the existence of variance difference between the two samples. Based on the homogeneity test, it was obtained $\text{sig} = 0{,}591 > 0{,}05$, then H_0 was accepted. It meant the variance of both groups were not equal. The last test was the average variance test. It was used to find out whether the data of both samples had different variance or not. Based on the average of variance equality test, it was obtained $\text{sig} = 0{,}274 > 0{,}05$. Thus, H_0 was accepted. It meant both groups were equal. Thus, the samples had met the normal distribution requirement. They also were from homogeneous

variance and had equal variances. The next step was providing the intervention and ended by giving the post-test of the learners' problem-solving abilitys.

The learning was deemed effective when it met (1) the average problem-solving abilitys of the learners taught by blended learning assisted by social media had reached the standard of minimum mastery, (2) the proportion of the learners' problem-solving ability taught by blended learning assisted by social media had reached higher than 75% upon the standard of minimum mastery, and (3) the problem-solving ability average of the learners taught by blended learning assisted by social media was better than the control group.

The results were taken from the post-test of problem-solving abilitys. The result summary could be seen in Table 1.

Table 1. Final Result

Sample	n	$\bar{x}$
Experimental Group	36	86.22
Control Group	36	83.92

The experimental group obtained an average score of 86.22. On another hand, the control group obtained an average score of 83.92 after the post-test of problem-solving abilitys. It could be seen that the learners' scores of the experimental group were higher than those in the control group.

The next stage was the learning effectiveness test. It was done by analyzing the post-test of problem-solving abilitys. In the first criterion, the minimum mastery standard score was already determined. It was 72. In the minimum mastery standard test, it was obtained $\text{sig} = 0{,}000 < 0{,}05$. Then, it was denied. Meanwhile, H_0 meant that the average scores of the post-test for the experimental group was higher than 73. Thus, it had reached the minimum mastery standard. Thus, it could be said that the requirement of the first effectiveness was met.

In the second criterion, the proportion of the learners' problem-solving abilitys taught by blended learning assisted by social media was higher than 75%. Based on the proportion test or the classical completeness, it was obtained $\text{z hitung} = 1{,}64, \text{z table} = 3{,}079$. Thus, $\text{z count} < \text{z table}$ denied H_0. It meant the learners' completeness proportion taught by blended learning assisted by social media had reached higher than 75%. The next stage, conducting the average variance test, was purposed to find out the differences between both groups' problem-solving abilitys, either taught by blended learning assisted social media or taught by problem-based learning. Based on the average variance difference test, it was obtained $\text{t count} = 1{,}27$ and $\text{t table} = 1{,}67$. Thus, it is clear that t count <t table. Therefore, it accepted H_0. It means the average of the problem-solving ability of the learners taught by blended learning assisted by social media was lesser or equal to the problem-solving abilitys of learners taught by PBL. However, when the average scores were observed, the experimental group obtained $86{,}22 > 83{,}92$ of the control group's average score. It meant the learners' problem-solving average abilitys, taught by blended learning assisted by social media, were higher than the average score of the control group taught by PBL. Thus, it could be said that those three learning requirements had been met.

Based on the explanation, it was obtained that: (1) the learners' problem-solving ability average scores, taught by blended learning assisted by social media, had reached the minimum mastery standard, (2) the proportion of the learners' problem-solving abilitys taught by blended learning assisted by social media had surpassed 75% of the given minimum mastery standard, and (3) the average score of the experimental group learners' problem-solving abilitys was higher than the control group learners.

The syntax of blended learning assisted by social media could stimulate the learners to improve their learning autonomies. It was due to when learning at home, the learners were given a problem and asked to understand it autonomously. When the learners had not understood, the problem could be discussed during the in-classroom meeting alongside the learners' preparations. This learning did not only involve face-to-face learning but also autonomous learning for the learners. The learners taught by blended learning were better than the common group learners. It was effective and provided a significant positive impact (Dziuban, Graham, Moskal, Norberg, & Sicilia, 2018; Dianawati, Kartono, & Wardono, 2018; Anggreanisita,

Zaenuri, & Rochmad, 2020; Ulinnuha, Waluya, & Rochmad, 2021).

The next stage was the qualitative data analysis concerning the problem-solving ability reviewed from the independent learning ability. The experimental group learners obtained the independent learning ability questionnaire to group the learners based on the categories of high, moderate, and low. Here are the results of the independent learning ability questionnaire from 36 learners, as shown in Table 2.

Table 2. The Independent Learning Ability Classification

Group	Number of the Students
High	6
Moderate	24
Low	6

The findings showed that the problem-solving ability description was reviewed from the varieties the independent learning ability. It was shown by 6 students with high independent learning ability. There were 3 students with excellent problem-solving abilitys and 3 students with fair problem-solving abilitys. From 24 students with moderate independent learning ability, there were 10 students with excellent problem-solving abilitys, 12 students with fair problem-solving abilitys, and 3 students with low problem-solving abilitys. From 6 students with low independent learning ability, 1 student had excellent problem-solving abilitys, 3 students with fair problem-solving abilitys, and 2 students with sufficient problem-solving abilitys.

The high category independent learning ability learners could meet all four problem-solving ability indicators based on Polya's stage properly. It is in line with Anggreanisita (2020), Faridh (2019), Munahefi, Waluya, & Rochmad (2018), and Supriatna (2019) that learners with high independent learning ability abilitys could keep up the learning maximally. However, learners with fair problem-solving abilitys did not write the recognized information from the questions completely. They did not write the solution strategy. It is in line with Nurvicalesti (2019) that learning with a high category had difficulties in designing problem-solving abilitys strategy. They were not habituated with the mathematics problem-solving stages.

The learners with a moderate independent learning ability category could perform the problem-solving ability properly. They could understand the problems by writing the recognized items and created the problem graphics. They could also arrange the solution strategy although it was not less accurate. It is in line with Nalurita (2012) that learners with moderate independent learning ability could use the symbols and formal language. However, they were less capable to use the operation concerning the simplification technique of the expression.

The learners with the sufficient independent learning ability category. They could write the recognized items but they were not accurate. They also did not write the problem-solving strategy. It is in line with Zaenuri (2020) that learners had difficulties to express their mathematics ideas into notation symbols correctly. Munahefi et al (2018) stated that learners had put their efforts to create the solution strategy although it was not accurate. It could be caused by their carelessness. Concerning the rechecking strategy, the learners could conclude the completed problems. It is in line with a study conducted by Anggreanisita (2020) that learners with low independent learning ability could not maximize their reasoning abilitys concerning the problems accurately. Thus, the solution process had several mistakes dealing with the calculation. Thus, it made the learners could not conclude accurately and correctly.

CONCLUSION

Based on the analysis and discussion results, it was obtained that blended learning assisted by social media was effective to improve problem-solving abilitys. It was because the applied model and the problem-solving description reviewed from the learners' independent learning ability showed various results.

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