The Effect of Blended Learning Using Tutorial Video towards Problem Solving Ability Reviewed of Students' Logical Intelligence

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Abstract- This study aimed to find out whether students' mathematics problem-solving ability (MPSA) taught using Blended Learning Using Tutorial Video (BLTV) is higher than those using conventional learning. This research used a concurrent mixed method that combined quantitative and qualitative research. Posttest only control design used for the quantitative data, while descriptive analysis used for the qualitative data. The population of the research was 524 students from the whole eighth grade in state junior high school of SMPN 1 Tabanan-Bali. In addition, cluster random sampling had done after testing the sample's equivalent. The data obtained were analyzed using ANAVA test 2 tracks. The data on students' problem-solving ability were collected through problem-solving ability test, while qualitative data were collected through questionnaire, interview, and observation sheet. The results of quantitative data indicate that: (1) BLTV is able to give a positive contribution towards students' mathematics problem-solving ability, (2) in the group of higher logical intelligence level, students' MPSA taught using BLTV is higher than those using conventional learning, (3) in the group of lower logical intelligence level, students' MPSA taught using BLTV is higher than those using conventional learning, (4) BLTV is proved to improve students' MPSA. The results of the qualitative data explained in the form of a brief essay, diagram, and physical evidence. Furthermore, the results of qualitative data indicate that: (1) students are more enthusiastic and motivated in problem-solving activities. (2) Students are braver and more independent in stating their opinions or difficulties during the online discussion.

Keywords-Blended Learning, Tutorial Video, Online Discussion, Logical Intelligence, Mathematical Problem Solving Ability

I. INTRODUCTION

Globally the use of blended learning in the recent decade has increased very rapidly, including in Indonesia. But the notion of blended learning (often used synonymously with Hybrid Learning[1]) also varies. The results of research on the impact of using blended learning on various learning outcomes also vary [2]. Some research results on the application of blended learning have positive results, such as increasing students involvement and engagement [3], and and showing gains in learning achievement and thinking abilities[4], facilitating active learning, deepen understanding, enhancing critical as well as thinking skills, promoting creative communication [5].

On the other hand, there is a major drawback in high-cost costs for preparing content materials, substantial costs for system maintenance as well as students' feeling of depression and isolation in virtual environments [5]. Blended learning needs rigorous efforts, good attitude, enough budget and highly motivated teachers and students for its successful implementation [6]. Likewise, the blended learning model and its tools to support a good blended learning are also different [7], [8]. School readiness, teacher ability, and student readiness also appear to be very influential [9], [10]. According to [4] there are four components in the model of blended learning, namely principles, objectives, procedures and instructional activities, and measurement and evaluation. Therefore, it appears that before implementing blended learning many things need to be prepared such as internet network infrastructure readiness, teacher, and student readiness, and the right models and methods need attention[11],[12].

In this study blended learning was used with a flipped model type with the help of video tutorials. Flipped models are intended to divide learning activities into two sessions, namely online sessions focused on learning mathematics topics independently, while face-to-face sessions are focused on problem-solving activities.

In order for online learning to work effectively with the aim of students being able to understand mathematical concepts well, then we used a video tutorial made by the teacher, which contains explanations of mathematical concepts with the help of interesting animations, images, and sounds. The type of video tutorial used is a Khan Academy-video like. The difference is the video made by the teacher using animation so that the picture is more interesting. In addition, online discussions between students are also required so that students

are trained to exchange ideas for solving mathematical problems they deal with. In this case, the teacher acts as a moderator and facilitator. With the blended learning model, it is expected that there will be an increase in understanding of concepts and students' problem-solving abilities, while also fostering students' confidence in exchanging thoughts, ideas and solution. But it seems that many factors that will influence the success of blended learning goals, one of them might be the intelligence factor. Therefore the problem statement of this study are (1) Is there any effect of BLTV on students 'MPSA ?, (2) how does the BLTV influence the students' MPSA ?.

II. RESEARCH METHODS

This research aimed to know the effect of BLTV towards students ability in solving mathematics problem reviewed of students' logical intelligence in 8th grade at SMP Negeri 1 Tabanan. This research used a concurrent mixed method which combines quantitative and qualitative methods to obtain a comprehensive analysis of the research problem[13]. Moreover, the design was embedded design concurrent mixed methods, in which this research used quantitative research as the priority that supported by qualitative research.

The types of instruments were tests and non-tests. Research instrument is a tool that used by the researcher to collect data [13]. In order to collect quantitative data, the researcher used test to measure students' ability in solving mathematics problem. Meanwhile, non-test used to collect qualitative data through observation sheet to measure students' activities in solving mathematics problem that taught using blended learning-based video and conventional learning. In addition, questionnaire also used to know the contribution of the applied learning model toward students' ability in solving mathematics problem. Therefore, the researcher set instruments that consist of quantitative and qualitative instruments.

Moreover, in order to get valid data, a good instrument is required so that the reliability of the study is secure, in which it has three specifications, namely (1) the validity of instruments that include content validity by using Gregory formula which had been tested previously by judgments, and item validity that calculated using product moment, (2) the reliability of the instrument is calculated by Cronbach Alpha formula, as well as (3) different capacity analysis test using Ferguson formula. Before the test is carried out to obtain a conclusion, the data have to fulfill the prerequisite tests; (1) normality test using Chi-Squared and (2) homogeneity test using F-test formula.

If the sample retrieved is in normal distribution and has homogeneity variation, it will be continued to the hypothesis test using ANAVA two tracks. The criteria of significance are done by comparing the results to calculate F (F_{count}) at F table (F_{tab}) with significance level 5% (F 0.05). If $F_{count} > F_{tab}$, it can be interpreted significant and if $F_{count} < F_{tab}$, it can be interpreted not significant. Tukey test was used to continue ANAVA test when the number of respondents or members of each group were same.

III. RESULT AND DISCUSSION

A. Quantitative Results

The data of students' ability in solving mathematics problem that obtained from post-test which given in control and experimental classes can be seen in Table 1.

TABLE I.   STUDENTS' ABILITY IN SOLVING MATHEMATICS PROBLEM

Class	N	Average	Variant
Experimental	39	66,03	237,55
Control	39	46,77	42,39

Based on Table 1, it can be seen that the average score of students' ability in solving mathematics problem who follow blended learning-based video is higher and the average score of students' ability in solving mathematics problem who follow conventional learning is lower. In order to find out whether there is a difference of students' ability in solving mathematics problem in experimental and control groups, it needs to do hypothesis test. Before the hypothesis test is done, normality and homogeneity variation tests of the results of students' ability in solving mathematics problem are done first. Chi-Square test used to find out the normality of the data and F-test used to know the homogeneity variation of the data. The results of Chi-Square and F tests indicate that both of those classes have normal distribution in problem solving ability and the variation of the data are homogeneous. After normality and homogeneity tests are done, then it continued to do hypothesis test using ANAVA two tracks.

The results of ANAVA two tracks test indicate that $F_{count} = 110.297$ and $F_{table} = 4.062$ at significance level 0.05, while $F_{table} = 7.248$ at significance level 0.01. $F_{count} > F_{table}$ for both significances, so it means that H_0 is rejected and H_1 is accepted. In order words, it means that students' ability in solving mathematics problem who follow blended learning-based video is higher than those who follow conventional learning.

The results of data analysis show that the average score of students' problem solving ability that has higher logical intelligence level who follow blended learning-based video is 81, while the average score of students' problem solving ability that has higher logical intelligence level who follow conventional learning is 56,25. In addition, the results of ANAVA two tracks test show that the average of square number (RJK_D) is 47.032. Next, Tukey test is done and it obtains different average score of students' problem solving ability.

In the group of students who have higher logical intelligence level, the $Q_{count} = 17.680$, while Q $(_{table} \alpha = 0.05; 2; 44) = 2.86$. Thus, $Q_{count} > Q_{table}$ means that H_o is rejected and H_1 is accepted. It means that students who have higher logical intelligence level and follow blended learning-based video have better problem solving ability than those follow conventional learning.

The results of data analysis show that the average score of students' problem solving ability that has lower logical intelligence level who follow blended learning-based video is 63.75, while the average score of students' problem solving ability that has lower logical intelligence level who follow conventional learning is 46.917. In addition, the results of ANAVA two tracks test indicate that the average of square number (RJK_D) is 47.032. Next, Tukey test is done and it obtains different average score of students' problem solving ability. In the group of students that have lower logical intelligence level, Q_{count} = 12.025, while Q ($_{table}$ α = 0.05; 2; 44) = 2.86. Thus, $Q_{count} > Q_{table}$, meaning that H_o is rejected and H_1 is accepted. It means that students who have lower logical intelligence level and follow blended learning-based video have better problem solving ability than those follow conventional learning.

The results of ANAVA two tracks test indicate that $F_{AB (count)}$ = 3.998 and the value of F_{table} = 4.062 at significance level 0.05, as well as the value of F_{table} = 7.248 at significance level 0.01. $F_{AB (count)} < F_{table}$ at significance 0.05 and 0.01, so that H_0 is accepted and H_1 is rejected. It means that there is no interaction between the implementation BLTV and logical intelligence toward students' problem solving ability.

B. Qualitative Results

Qualitative data refers to the data of students' activities in solving mathematics problem. It is also supported by findings of students' activities in solving mathematics problem whether it is in experimental or control classes. The findings are 1) students' enthusiasm in following applied learning model, in which students in experimental group are more enthusiastic in following applied learning model, 2) students' understanding of given problem and rewrite the information that is contained in the problem which useful to solve the problem itself, in which students in experimental group seem more capable and detail in understanding the problem, 3) students are able to plan the solution and use that solution to solve a problem, in which students in experimental group are better in making planning and solving problems compared to control group.

Based on data analysis, students in experimental group give positive feedback to the contribution of learning model toward their ability in solving problem with the average score is 51,31. Meanwhile, students in control group give enough positive feedback to the contribution of learning model toward their ability in solving problem with the average score is 48,69. It means that the contribution of blended learning-based video towards students' ability in solving mathematics problem is better compared to the contribution of conventional learning toward students' ability in solving mathematics problem. This data contribution is supported by students' comments in experimental and control classes about the learning model that applied in the classroom. In general, it can be said that the students' comments of blended learning-based video indicate that they feel more guided, especially in solving story problems. Students have more opportunities to practice exercises at home because they demanded to use required web outside school schedule or outside face-to-face learning in the school.

C. Discussion

Based on the results of analyzing students' score of mathematics problem solving ability, it is known that the average score of students' ability in solving mathematics problem in experimental group is higher than those in control group. In other words, students' ability in solving mathematics problem in 8th grade at SMP Negeri 1 Tabanan who follow blended learning using tutorial video (BLTV) is better than those who follow conventional learning. It means that BLTV is able to give meaningful contribution to improve students' ability in solving mathematics problem in 8th grade at SMP Negeri 1 Tabanan. This result is supported by a positive students' responses to BLTV. Students have expressed that they have learned more effectively in the BLTV environment. Students were more enthusiastic and motivated in solving mathematics problem during blended learning activities, they were also braver and more independent in stating their opinions or difficulties during online discussion.

Those results can occur because BLTV accustoms students to keep learning at home (outside the school schedule) and provide the students a better learning environment so that they have the opportunity to repeat and exercise the complex mathematical concept trough tutorial videos. Online discussion has also a positive contribution for immediate solution of students'problem using the question-answers forum in the discussion board. This feature of students activity in BLTV is able to make students capable of doing good mathematics problem-solving. BLTV is also trying to change the learning atmosphere which usually monotone and boring becomes fun and exciting with a collaboration among students and their friends, as well as students and teacher.

In addition to online learning session, the face-to-face classroom learning session of this BLTV scenario had also given the students more contextual and challenging problem-solving activity. The students feel more confident and more engaged in construction solution of the complex mathematical problem. This is possible because the students look more prepared, more motivated and more curious to implement their knowledge they have built during the online phase of their learning.

In this research learning and doing mathematics by applying BLTV is done through several steps. First, the students have to create an account and log into the learning management system (LMS). Second, the teacher has to upload tutorial videos, online task, as well as a selected online discussion topic inline with the learning objective, and finally start to open the online session of the BLTV-scenario. In this online learning scenario, students are given the opportunity (1) to understand the concept of mathematical topics presenting in the tutorial video, (2) doing mathematical exercises (3) participating in the discussion forum, and doing questin-answers (Q-A) online activity. In this session, the teacher plays important role in facilitating students with a variety of knowledge and skill through his video, well-organized learning techniques as well as motivating students to actively engage in the online discussion forum and Q-A activity. Third, the teacher has to prepare and conduct the classroom face-to-face session of the BLTV scenario. In this phase the teacher has a

very important role in facilitating the student with the high quality of problem-solving activity, to provide the students with a variety of well selected but challenging mathematical problem-solving tasks. This phase is also offered the opportunity to students to practice their communication skills.

The explanation above gives an overview that BLTV brings a positive effect on students' ability in matematics problem-solving. This result in line with the previous research findings that blended learning in different type of its implementation is able to increase students involvement and engagement [3], and show gains in learning achievement and thinking abilities [4], facilitate active learning, strengthen understanding, enhance critical thinking skills as well as promote creative communication [5].

IV. CONCLUSION

The research results show that: (1) The BLTV gives a positive effect on students' ability in solving a mathematics problem. (2) In the group of students with higher logical intelligence level, the students who participate in BLTV performance higher than those who follow the conventional learning. This result has also occurred in the group of students with lower logical intelligence level. (3) The students' responses were positive to BLTV. Students have learned more effectively in the BLTV environment and they felt more confident and more engaged in construction solution of the complex mathematical problem. Students were more enthusiastic and motivated in solving mathematics problem and they were also braver and more independent in stating their opinions or difficulties during online discussion.

REFERENCES

[1] M. Barbour, 'Online and Blended Learning: A Survey of Policy and Practice from K-12 Schools around the World.', *International Association for K-12 Online Learning*, Nov. 2011.

[2] I. M. G. Sukawijaya and I. G. P. Sudiarta, 'Developing blended learning environment to improve learning performance and self-reliance for junior high school students', *Journal of Physics: Conference Series*, vol. 1040, p. 012030, Jun. 2018.

[3] B. A. Hussein, 'A Blended Learning Approach to Teaching Project Management: A Model for Active Participation and Involvement--Insights from Norway.', *Education Sciences*, vol. 5, no. 2, pp. 104–125, May 2015.

[4] P. Kingpum, 'A Development of a Collaborative Blended Learning Model to Enhance Learning Achievement and Thinking Ability of Undergraduate Students at the Institute of Physical Education.', *Educational Research and Reviews*, vol. 10, no. 15, pp. 2168–2177, Aug. 2015.

[5] W. S. Chen, 'An Empirical Evaluation of Critical Factors Influencing Learner Satisfaction in Blended Learning: A Pilot Study.', *Universal Journal of Educational Research*, vol. 4, no. 7, pp. 1667–1671, 2016.

[6] Lalima and Kiran Lata Dangwal, 'Blended Learning: An Innovative Approach.', *Universal Journal of Educational Research*, vol. 5, no. 1, 2017.

[7] I. G. P. Sudiarta, I. N. Sukajaya, and I. G. P. Suharta, 'Investigation on students' mathematical online discussion: A case study in grade 8 SMPN 1 Denpasar', *Journal of Physics: Conference Series*, vol. 1040, p. 012031, Jun. 2018.

[8] O. Darojat, 'Improving Curriculum through Blended Learning Pedagogy.', *Turkish Online Journal of Distance Education*, vol. 17, no. 4, pp. 203–218, Oct. 2016.

[9] I. G. P. Sudiarta and I. W. Sadra, 'Pengaruh Model Blended Learning Berbantuan Video Animasi Terhadap Kemampuan Pemecahan Masalah Dan Pemahaman Konsep Siswa', *Jurnal Pendidikan dan Pengajaran*, vol. 49, no. 2, pp. 48–58, Dec. 2016.

[10] F. Fatimah, 'Analysis of the Use of Online Tutorial.', *Online Submission*, 2012.

[11] D. Rahardjo, 'Internet Access and Usage in Improving Students' Self-Directed Learning in Indonesia Open University.', *Turkish Online Journal of Distance Education*, vol. 17, no. 2, pp. 30–41, Apr. 2016.

[12] M. I. Farisi, 'Students' Performance at Tutorial Online of Social Studies through the Use of Learning Cycle Model.', *Turkish Online Journal of Distance Education*, vol. 15, no. 4, pp. 229–247, Oct. 2014.

[13] J. W. Creswell, 'Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research', vol. 4, p. 673, 2012.

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