Designing Hybrid Learning Tools Based on Lesson Study for Learning Community against Metacognition Ability

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Abstract
This study aims to analyse the outcomes of establishing valid, practical, effective Hybrid Learning tools based on Lesson Study for Learning Community (LSLC) and their impact on students' metacognitive abilities. Research and Development (R & D) and experimental research are used to conduct the study. The research subjects are consisted of three classes of 7th grade students. Collaborative Learning and Learning Community are implemented which are the components of LSLC. The 4-D model, which includes define, design, develop, and disseminate, is used to develop learning tools. Lesson plans, worksheets, and a metacognition ability test were created because of the research and met the criteria of being of valid, practical, and effective. Based on experimental research, there is a significant effect of Hybrid Learning tools based on Lesson Study for Learning Community on students' metacognitive abilities with p-value of 0.001 (sig < 0.05).

Abstrak
Penelitian ini bertujuan untuk menganalisis hasil pengembangan perangkat pembelajaran Hybrid Learning berbasis Lesson Study for Learning Community yang valid, praktis, efektif dan menganlisis pengaruhnya terhadap kemampuan metakognisi siswa. Metode penelitian yang digunakan dalam penelitian ini yaitu metode penelitian kombinasi atau mix method. Penelitian ini menggabungkan dua bentuk penelitian yaitu penelitian pengembangan (research and development) dan penelitian eksperimen. Subjek penelitian dalam penelitian ini terdiri dari tiga kelas siswa VII yang terdiri dari kelas uji coba, kelas eksperimen dan kelas kontrol. Komponen Lesson Study for Learning Community yang diterapkan yaitu Collaborative Learning dan Learning Community. Proses pengembangan perangkat pembelajaran dilaksanakan melalui 4-D yaitu pendefinisian, perancangan, pengembangan dan penyebaran. Hasil pengembangan perangkat pembelajaran Hybrid Learning berbasis Lesson Study for Learning Community berupa RPP, LKS dan tes kemampuan metakognisi siswa yang valid, praktis dan efektif. Berdasarkan penelitian eksperimen dan observasi, terdapat pengaruh yang signifikan perangkat pembelajaran Hybrid Learning berbasis Lesson Study for Learning Community terhadap kemampuan metakognisis siswa dengan nilai signifikasi 0.001 ($sig < 0,05$).

Keyword*s: Instructional Tools; Hybrid Learning; LSLC; Metacognition; Collaborative Learning.*

INTRODUCTION

Mathematics is a branch of science that has a hierarchical, structured, logical, and systematic concept (De Corte, 2003; Martini, 2014). Mathematics education is designed to teach students how to think rationally, analytically, systematically, critically, and creatively, as well as spot patterns and generalize experiences (Anggo, 2011; Abdurrahman, 2012). Mathematics plays a crucial function in solving daily life problems. However, in fact, many students have difficulty in comprehending material. One of the issues with mathematics is that students have a hard time understanding what is known, what is being asked, and how to solve the problem appropriately, which known as polya stage (Ariestina, Yunarti, & Sutiarso, 2014; Sudirman, 2019). Solving these mathematical problems require a thought process related to awareness, known as metacognition (Hasanah, Rosyida, & Rachmani, 2021; Anggo, 2011).

Metacognition ability is a person's cognitive knowledge and awareness of their thinking process to develop planning, monitoring, and evaluating (De Corte, 2003; Desmita, 2017; An & Cao, 2014; Rozen & Kramarski, 2014). According to Lauren and Swartz and Perkins metacognitive abilities are divided into four, namely tacit use, aware use, strategic use, and reflective use. Based on previous research conducted by Wang, Haertal, and Walberg, in papers Shen and Liu it is stated that metacognition is the first factor of 200 factors that influence a person's academic. According to Nasution and Sihombing (2017) and Kristiani *et al* (2017). assessment, the rate of education in Indonesia is not quite effective due to the low metacognitive ability of students.

Hybrid learning is also called as blended learning, namely a form of learning that combines in-class face-to-face instruction with online instruction (Heinze & Procter, 2010). In this study, researchers used a type of hybrid learning, namely flex learning that combines synchronous and asynchronous learning. Indonesia has been facing the covid pandemic recently, which impact to direct learning interactions being replaced by distanced learning (Al-Fatih, 2020; World Health Organization, 2020). In such situations, educators are required to be more creative in designing learning tools and methods. In the 4.0 era, learning mathematics requires creative and meaningful forms of learning, so Hybrid Learning is one of alternative ways. The learning component of Hybrid Learning consists of online learning (asynchronous), face-to-face learning (synchronous), and independent learning (Istianingsih & Hasbullah, 2015; Kristiani *et al*, 2017). Besides, to facilitate students in using online classroom platforms for free, Hybrid Learning can enhance students' metacognitive abilities (Thongmak , 2013; Husahamah, 2014; Kenedi, 2018; Saleh, Rukiyah, & Arbain, 2021; Lin & Wang, 2012; Wu, Tennyson, & Hsia; 2010; Sriarunrasmee, Techataweewanb, & Mebusaya; 2015).

The implementation of Hybrid Learning has been widely carried out in Indonesia and several countries such as in Asia, Australia, Europe, and America (Prayitno *et al*, 2019; Husahamah, 2014; Murtikusuma *et al*, 2021; Sowanto *et al*, 2019; Guntur, Krtono, & Junaedi, 2021; Fredriksen, 2021; Asyrofi & Junaedi, 2016). Previous research stated that Hybrid Learning can improve students' higher-order thinking skills (Guntur, 2021) and exploring realistic mathematics education (Fredriksen, 2021)

In this study, the researchers combined the hybrid learning method (seeking of information, acquisition of information, synthesizing of knowledge) with

the Lesson Study for Learning Community component (learning community and cooperative learning) to examine students' metacognitive abilities. At the stage of finding information, students and groups share tasks to identify problems by seeking information through offline and online media. The information they get is generalized by having them write down what they know and being quizzed on the questions. Based on these stages, the analysis of the stages of metacognitive ability in the planning stage.

At the information acquisition stage, students and groups exchange opinions from the information obtained and their resolution. The results of the discussions they have discussed are generalized to a solution. Based on these stages, the analysis of the stages of metacognitive ability is the monitoring stage.

At the stage of synthesizing knowledge, students and groups check the accuracy by correcting answers. In addition, students are also given a stimulus through student worksheets to provide opportunities for their friends if there are different ways or solutions. The results of the final discussion are generalized by concluding conclusions and other solutions if any. Based on these stages, the analysis of the metacognitive ability stage process is the evaluation stage.

The integration of metacognitive abilities in Lesson Study for Learning Community (LSLC)-based Hybrid Learning is presented in Table 1.

Table 1. integration of metacognitive abilities in LSLC-based Hybrid Learning

Hybrid Learning Indicators	Metacognition Indicators
identify problems by seeking information with the group	*Planning (seeking of information)*: Make a list of what is known and what is being asked in the questions Identify the steps needed to solve the problem
plan a problem-solving strategy with the group	

Hybrid Learning Indicators	Metacognition Indicators
Discuss the information obtained	*Monitoring (acquisition of information)*: Implement the plan or solution that has been obtained Monitor the solutions obtained are appropriate or not
Provide opportunities for friends to have an opinion	
Correcting mistakes and correcting each other's correctness of answers with the group	*Evaluating (synthesizing of information_:* Re-checking the answers Write a conclusion or method or another
Give a chance to friends if they have a different way or solution	

Meaningful learning, especially mathematics, can be done through cooperation between peers by building a learning community. This corresponds with of Lesson Study for Learning Community qualities, notably collaborative learning and learning community (Saito, Murase, & Tsukui, 2015; Murtikusuma, *et al*, 2021, Indrawanti *et al*, 2019).

Based on these problems, metacognition is the main factor that affects students' academics. Metacognition ability can be formed through meaningful learning which is implemented through LSLC. So, this research takes an action to develop a hybrid learning tools based on Lesson Study for Learning Community, which will be utilized to assess the impact against students' metacognitive ability.

METHOD

A mixture research approach, often known as a mix method, was used in this study, which combines qualitative and quantitative methods. Qualitative methods are research and development, and quantitative methods are experimental

research. The experimental research design used quasi-experimental research, namely pretest posttest non-equivalent control group design. The technique used is the Cluster Random Sampling technique by taking two classes randomly to be used as the experimental class and the control class. In this study, qualitative research is development research that uses a 4-D model. This development model consists of four stages a) defining is an observation activity to see student learning experiences, learning systems, teaching materials to setting learning objectives, b) design is an activity to make lesson plans, student worksheets and metacognitive ability tests on the subject of the Association (draft I), c) development is a validation activity of learning tools and research instruments carried out by validators and practitioners (draft II) and tested for development classes and analyzed for practicality and its effectiveness, and d) dissemination is an activity to disseminate learning tools to experimental classes, mathematics teachers, and blogger media.

Quantitative research was obtained based on the independent samples t-test. The requirements for independent samples t-test are that the data must be normally distributed and homogeneous. Kolmogrov-Smirnov test for normality and Levene's Test for homogenity. The two tests were carried out on the pre-test and post-test score data for the control and experimental classes to determine the effect of the Lesson Study for Learning Community (LSLC)-based Hybrid Learning tools on students' metacognitive abilities. The pre-test and post-test value data shows that the significance value is more than 0.05, which means that the two classes are homogeneous and normally distributed. Meanwhile, to see the effect using the independent samples t-test. On the pre-test data, the results of the independent samples t-test showed that the control and experimental classes had a significance value of more than 0.05, which means that before being given treatment there was no significant effect between the metacognitive abilities of the control and experimental class students. However, this is different from the post-test value data which shows that the control and experimental classes have a significance value of less than 0.05, which means that after being given treatment there is a significant effect between the metacognitive abilities of the control and experimental class students. So, it can be concluded that, Hybrid Learning tools based on Lesson Study for Learning Community (LSLC) have an influence on students' metacognitive abilities.

Table 2. Research Design Scheme

Experiment class	O_1	X_1	O_3
Control Class	O_2	X_2	O_4

Description:
O_1, O_2 : pretest
X_1 : using hybrid learning based LSLC
X_2 : using conventional learning tools
O_3, O_4 : post test

RESULT AND DICUSSION

Process of developing instructional tools

Stage of Define

The definition stage is the initial stage in developing 4-D model learning tools. The research activities at this stage are setting goals, material limits, learning formulations that are in accordance with real problems (especially during pandemic conditions) and the ability of students to learn mathematics. In the current covid pandemic situation, mathematics learning is usually done by giving assignments and just collecting them. Students do not feel a sense of mutual learning between students and even do not understand the

material given.

The defining stages consist of a) early-late analysis, activities to determine the basic problems of developing learning tools by identifying the 2013 pandemic curriculum (emergency curriculum), learning mathematics activities and teaching materials used, b) student analysis, activities identifying student characteristics including student experiences in individual and group learning and students' metacognitive abilities, c) concept analysis, activities to define and detail the material in accordance with the initial and final analysis, student analysis, Basic Competencies and Core Competencies, d) task analysis, activities to identify skills developed by students in each lesson includes the provision of worksheets, practice questions, and tests of students' metacognitive abilities, e) specification of learning objectives, activities to formulate indicators of competency achievement and learning objectives based on preliminary analysis to task analysis. Achievement indicators become the basis for preparing tests and designing learning tools.

Based on these considerations, one alternative to solving the problem is to develop a Hybrid Learning tools based on Lesson Study for Learning Community. This learning is carried out in a hybrid learning manner, namely synchronous (via zoom meeting) and asynchronous (via google classroom). In addition, learning is carried out by bringing up two components of Lesson Study for Learning Community (Learning Community and Collaborative Learning) in order to foster a sense of mutual learning between students with group learning and provide a stimulus to students' metacognitive abilities. The approach used is a contextual approach and discovery learning methods, assignments, discussions, and questions and answers.

Stage of Design

The design stage consists of the preparation of tests (criterion-test construction), media selection, format selection, and initial design. This activity aims to design learning tools. It will be validated and tested in a class. Based on the analysis of the design phase, the development of learning tools in the form of lesson plans, student worksheets and students' metacognitive test was carried out.

Stage of Development

The goal of development stage is to create learning tools that have been approved or validated by two lecturers and one mathematics teacher. Learning tools and instruments that have been validated and comply the valid criteria are tested on students of class VII G. Based on the analysis of learning activities, it shows that the learning tools comply the practical and effective criteria.

Stage of Disseminate

Learning tools that meet the criteria of being valid, practical, and effective criteria are ready to be deployed. The learning tools were distributed in the experimental class, namely class VII F. The learning tools met the practical and effective criteria based on the analysis findings.

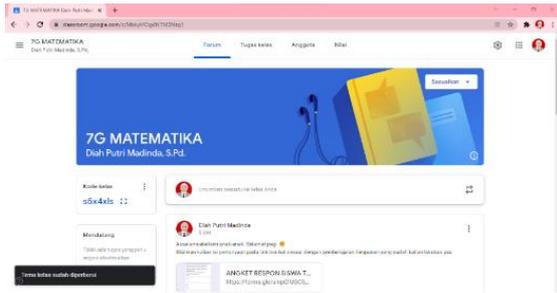*Figure 1. Synchronous Learning (zoom meeting)*

Figure 2. Asynchronous Learning (google classroom)

Result and Data Analysis of Developing Instructional Tools

Table 3. Validity Criteria

Instructional Tools	Coefficient	Criteria
Lesson Plan	4,7	Valid
Student Worksheet	4,8	Valid
Metacognition Test	4,8	Valid

Table 4. Practical Criteria

Activities	Aspect Value
1st meeting	88%
2st meeting	92%
3st meeting	94%
Aspect average	91%
Criteria	Very Good

Table 5. Effectiveness Criteria Based on Observation of Students Activities

Activities	Aspect Value
1st meeting	78%
2st meeting	80%
3st meeting	85%
Aspect average	81%
Criteria	Active

Table 6. Effectiveness Criteria Based on Students Response Questionnaire

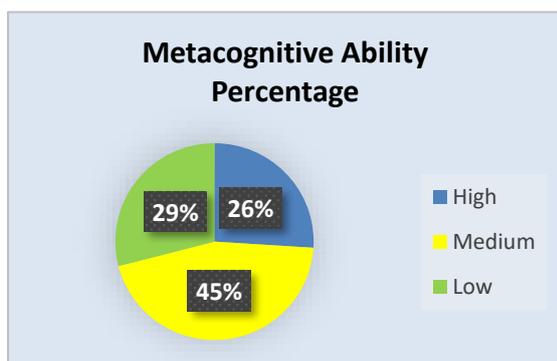| Percentage	Student Response	Number of Students
89%	Yes	28 students
11%	No	3 students

Figure 3. Percentage of Accomplishment and Meta-cognition Ability

Based on Tables 3 – 6 and Figure 3, the results of the development of Hybrid Learning tools based on Lesson Study for Learning Community meet the valid, practical, and effective criteria. The results of the coefficient of validity of lesson plans, worksheets and metacognitive ability tests are respectively 4.9; 4.8; 4.5. Practical criteria are met from the results of the implementation of learning tools by 91% with a very good category. The effectiveness criteria are met based on observational findings of student activities by 81% in the active category, 89% of students gave positive response and 89% of students met the criteria for completeness.

Effect of Instructional Tools against Metacognition Ability

Learning process in experimental class is carried out in class VII F using Hybrid Learning tools based on Lesson Study for Learning Community, while learning in the control class uses conventional learning. Learning activities were carried out in 4 meetings where pre-test for 1st meeting, 2nd and 3rd meeting provided learning tools in the form of worksheets, while in 4th meeting, games was carried out so that students did not feel bored of learning mathematics. Before the learning activities began, the researchers gave ice breaking. Learning activities is implemented by forming independent groups consisting of 4 students. The purpose of forming independent groups is to make

students feel free to express their opinion and comfortable with the learning process. Students conduct discussions through their online rooms.

Learning at experimental class emphasizes students in finding a concept on their own and teacher as a facilitator. Students gather with their groups (learning community) and collaborate (collaborative learning) to solve problems in student worksheets. Worksheet is given as a stimulus to direct students to their metacognitive abilities in finding a concept, while a metacognition ability exam is administered at the end of the lesson as a post test.

Learning process in the control class is carried out conventionally using direct instruction, namely the process of a teacher delivering material to a group of students is stressed more. The purpose of forming groups is so that students feel free to express their opinions and understand the material optimally. However, the worksheets given to the control class are in the form of routine questions that begin with a definition and correspond with the indicators for achieving the set subject matter. Figures 4 and 5 show group discussion activities in the experimental and control classes.
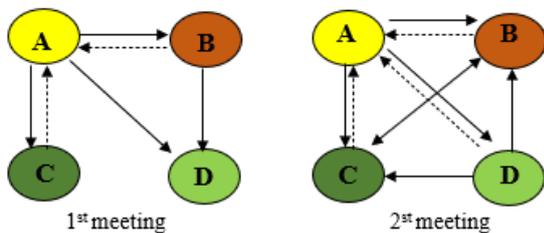

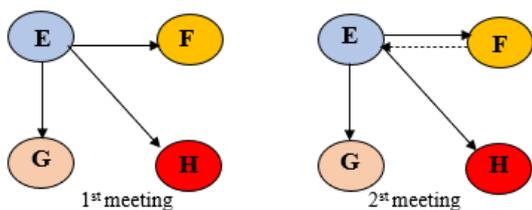
Figure 4. Experimental Class Group Discussion

Figure 5. Control Class Group Discussion

Description:
- - - - - - - - - - ▶ : Students asks
───────────▶ : Students explain

Based on the results of the post-test question number 4 and interviews with S1 and S4 obtained as follows.
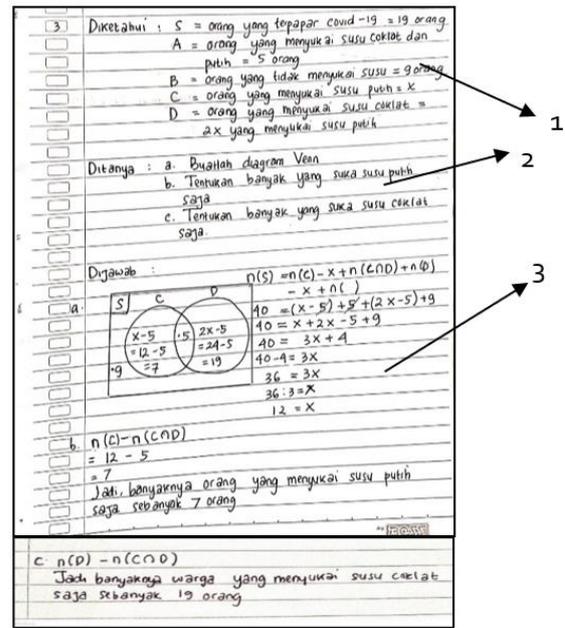

Figure 6. S1 Answer
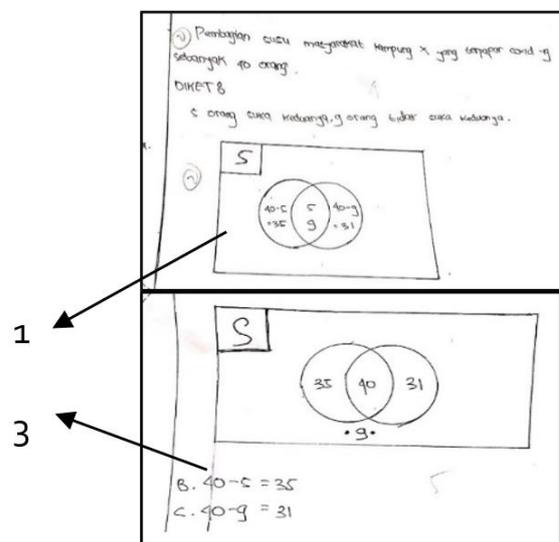
Figure 7. S4 Answer

Table 7 Students Answer Based on Metacognition Indicators

Subject 1 (S1)	Subject 4 (S4)
Planning:	*Planning*:
By writing out what they know in their own words, they will be able to comprehend	rewrite the given question, but it's not complete

Subject 1 (S1)	Subject 4 (S4)
the situation, but it is still not accurate and plan time to solve problems	
Monitoring: Write down what is being asked correctly	*Monitoring*: Do not write down what is being asked
Evaluating: generalize what is known and asked to answer the problem, use specific strategies, and write conclusions correctly and make improvements by fixing errors	*Evaluating*: do not understand the concept of the set, so the solution is wrong

Quantitative research was obtained from the independent samples t-test. The prerequisite test before the independent samples t-test test are the data must be normally distributed and homogeneous. Kolmogrov-Smirnov for normality and Levene's Test for homogeneity. Analysis of the normality test of the pre-test shows that the p-value of the experimental class is 0.149 and the control class is 0.063, while the homogeneity test for the experimental and control classes is 0.404. Based on this, it shows that the p-value of both classes is more than 0.05 (Sig > 0.05).

So, it can be concluded that the two classes are normally distributed and homogeneous.

Statistical tests are carried out using the independent samples t-test. Based on the Independent Samples t-test, the pre-test data in Table 8 shows p-value of 0.662 (Sig > 0.05). It can be concluded that before giving treatment, the average meta-cognitive abilities of the experimental and control groups did not differ significantly.

Analysis of the post-test data normality test shows that p-value of the experimental class is 0.061 and the control class is 0.064, while the homogeneity test for the experimental and control classes is 0.473. Based on this, it shows that the significance value of both classes is more than 0.05 (Sig > 0.05). So, the two classes are found to be normally distributed and homogeneous.

The prerequisite test showed that the independent samples t-test was used to perform statistical tests on the post-test data, which were normally distributed and homogeneous. Based on the Independent Samples t-test, the post-test data in Table 9 shows p-value of 0.001 (Sig < 0.05). So, it can be concluded that after

Table 8. Independent Sample t-test of pretest

		Levenne's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Student Metacognition ability	Equal variances assumed	.366	.547	.439	61	.662	1.52823	3.48121	-5.43288	8.58933
	Equal variances not assumed			.438	60.269	.663	1.52823	3.48559	-5.44335	8.49980

Table 9. Independent Sample t-test of post test

		Levenne's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Student Learning Result	Equal variances assumed	1.845	.179	3.330	61	.001	5.40625	1.62352	2.15982	8.65268
	Equal variances not assumed			3.315	55.937	.002	5.40625	1.63060	2.13969	8.67281

giving treatment, there is a significant difference in the average metacognitive ability between the experimental and control class students.

Discussion

Developed learning tools in this research are lesson plans, worksheets, and students' metacognitive ability tests. Lesson plan refers to the syntax of the Hybrid Learning combined with the Lesson Study for Learning Community component. Worksheet aims to provide a stimulus to explore students' metacognitive abilities and bring up the LSLC component in the form of collaborative learning and learning community, while the test developed is in the form of a student's metacognitive ability test that is in accordance with the indicators of achievement. The implementation of learning is carried out online in connection with the current pandemic conditions.

A valid, practical, and effective hybrid learning tools based on Lesson Study for Learning Community are used in experimental research with a quasi-experimental research design. Experimental research was carried out in two classes, namely the experimental and control classes. The experimental class uses learning tools that have been developed, namely Hybrid Learning tools based on Lesson Study for Learning Community, while the control class uses direct instruction learning with conventional methods. Based on the results of the experimental and control classes' pre-tests, it showed that there was no difference in the average score of metacognitive ability in the two groups and p-value 0.733. However, after giving treatment, the post test results showed that there is a difference in the average metacognitive ability between two groups with p-value 0.001. The percentage of high, medium, and low students'

metacognitive abilities in the experimental class respectively are 35.5%, 41.9%, 22.6%. Meanwhile, the percentage of students' metacognitive abilities high, medium, and low in the control class are 21.9%, 46.9%, 31.2%. It shows that the percentage of students with high metacognitive abilities in the experimental class is more than the control class. While the percentage of moderate ability in the experimental class is not quite different from the control class, and the percentage of low ability in the experimental class is less than the control class.

Hybrid Learning tools based on Lesson Study for Learning Community have a positive influence on students' metacognitive abilities. The results of this study are corresponding with Sailo's research (2017) which states that Hybrid Learning is effective because it is not monotonous and can build students' knowledge of what they do in everyday life, especially mathematics problems. This is supported by Sowanto's research (2019) that Hybrid Learning is an innovation in developing learning tools, so that students do not feel bored and interested in learning mathematics. In addition, the results of other studies show that collaborative learning is an important component in the classroom, so there will be no gap for students in solving a problem, while the teacher conducts the discussion and works as a facilitator (Abeysekera & Dawsom, 2015; Blair, Maharaj, & Primus, 2016; Hwang, Lai, & Wang, 2015; Santangelo, Cadieux, & Zapata, 2015). The research results of Salam *et al* state that Lesson Study can improve students' metacognitive abilities because learning is carried out in groups and provides opportunities for students to freely share opinions with friends.

CONCLUSSION

The results of the development of Hybrid Learning tools based on Lesson Study for Learning Community meet the valid, practical, and effective criteria. Coefficients of validity of lesson plans, worksheets, and metacognitive ability test in a row are 4,7; 4,8; 4,8. Practical criteria is based on the results of the implementation of learning tools by 91,3% with a very good category. The effectiveness criteria are based on the findings of student activity observation by 81% in the active category, 89% of student questionnaires responded positively, and 81% of students comply the criteria of completeness. The result of pre-test data analysis showed that the experimental and control classes are normally distributed and homogenous. The significance value of normality test for experimental and control classes are 0.149 and 0.063 and homogeneity test is 0.404. The independent sample t test is 0.0662 (sig>0.05) which indicates that there was no significant difference in metacognitive ability between experimental and control groups before treatment. The result of post test data analysis showed that the experimental and control classes are normally distributed and homogenous. The significance value of normality test for experimental and control classes are 0.061 and 0.064 and homogeneity test is 0.473. The independent sample t test is 0.001 (sig<0.05) which indicates that after giving treatment, there is significant difference of metacognitive ability of experimental and control classes.

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