Development of lesson study for learning community based learning tools using google classroom media and its impact on students’ creative thinking skills

N Hasanah¹, Hobri¹, M Fatekurrahman², M A Kusuma¹, N F D Hadiyanti¹
Mathematic Education Department University of Jember, Indonesia
Department of Mathematics University of Jember, Indonesia
Email: aku.hasanah12@gmail.com

Abstract Learning mathematics is a science that is learned as a very important basis for everyday life. The lesson study for learning community learning process that prioritizes group learning that involves peers in learning so that the creative thinking process between students increases. Along with the development of technology demands online-based learning to facilitate the learning process and be able to support students' creative thinking which can be measured from fluency, flexibility, originality and elaboration. The research aimed to develop lesson study for learning community based learning tools using google classroom media on three-variable linear equations material for X grade high school students and to determine the effect on students' creative thinking abilities. This research uses a mix method with a sequential Explorstorydesign combination model with a thiagardjan development model through the 4D domain, which are define, design, develop and disseminate experimental research using the nonequivalent control design with the results obtained from the pretest value functions to determine the initial knowledge and posttest for knowing knowledge after being given treatment. The results showed that the lesson study for learning community based learning tools using google classroom media were valid, practical and effective and had a significant impact on creative thinking.

1. Introduction
Education problems are experienced in every country, however, basically the quality of education can make human resources more advanced because of the learning process which is a holistic adaptation process to the world [1] and learning results from human interactions [2]. Learning mathematics is learning a basic science which plays a very important role in education [3][4] so it can be concluded mathematics is a fundamental discipline that can support the development of other sciences [3]. However, in reality, there are still many students who could not understand mathematics education, especially in the three-variable linear equation system [5].

One of the efforts to improve mathematical knowledge is to use learning using google classroom media which prioritizes children's skills in discussing between individuals or groups with one another so that collaboration between groups can improve students' ability to collaborate and more easily understand the material and makes students not feel neglected because of disability or other things [6] the ability to communicate and collaborate [7], in any activity that students do can affect students' abilities [8].

Three important elements that must be prioritized in the lesson study for learning process are Learning community, collaborative Learning, and jumping task [9]. Collaborative learning activities which can mean student involvement in learning [10] in LSLC are not only students collaborative but teachers can also collaborate so that collaboration will make teachers get new methods or learning that can be developed in their respective classes [11][5][12]. Group learning is used as learning that is
related together [5], helping each other, sharing and facilitating each other in order to achieve common
goals, both students who have high abilities and vice versa [13][14][15].

In addition to collaborative learning, there is community learning and a problem based on
jumping tasks is given in LSLC-based learning and given assignments that have skills to improve
students' creative thinking abilities[16]. Things that must be considered in learning activities are how
students communicate between groups (caring community) can take place, besides that there are things
that are no less important, namely collaboration between students, and with LSLC learning everything
is done openly, besides students who learn teachers can also learn from experience and observation[9].
It is expected that learning LSLC can affect students' creative thinking abilities, because by thinking
creatively improving thinking skills to solve daily problems is creative thinking [17][10] both
conceptually and empirically [2]. Students' creative thinking can develop a determined, confident
attitude in solving given problems [18]. Creative thinking in this study is at a level based on fluency,
flexibility, and novelty[19]. For fluency, students generate many solutions in solving problems,
student flexibility is able to solve given problems in different methods and for novelty, students use
new methods that are not the same [19].

Another thing that is no less important is the increase in knowledge of technology which is
balanced by the presence of human resources who can develop in their fields so that they will be able
to enhancethethe standard of education[10], technology is a challenges in the world of education from
various levels[20] and technology has a significant influence on every aspect of our lives [10][21]. The
development of technology is currently very popular[22] utilizing existing things in technology to
build shared knowledge between individuals[15]. Basically, students in learning must be bored [23] so
that, with the presence of technology supports collaboration [2] in education [15]. Thus, technological
advances and the development of mathematics are interrelated because the development of
mathematics can facilitate technological advances, while technological and scientific developments
can demand developments in mathematics [24], so that in learning, always use technology science that
can help the learning process especially in the pandemic era such as the current google classroom
media will be very helpful in the learning process.

Apps for Education was introduced by google in 2014 that can be used online learning process,
namely google classroom [20], which can be used as a tool for communication. An application that
can help the learning process is the google classroom because it can be used easily, does not contain
advertisements and can save data packages [20] so that google classroom can be used as a learning
medium in this research.

2. Research Methods
This study used a mixed method, namely the Thiagarajan 4-D model development research method
and experimental research. The Thiagarajan 4-D model comply the development process instruction
which consists of four stages, those are Define, Design, Develop, and, Desseminate [25]. The
development for this research was carried out at SMAN 1 Panji Situbondo in class X Mipa1 with a
total of 35 students. Data collection process in this study used expert validation if the data was said to
be valid then it could only take a step at the next stage, observations were made by several team
groups who functioned as observers, tests of students' creative abilities obtained from student work
were given in the form of writing, and strengthened with the interview. The following are the details in
the research data, which are as follows.

| No | Data             | Data Collection                                                                 |
|----|------------------|---------------------------------------------------------------------------------|
| 1  | Validity         | Learning tool is said to be valid if it meets the validity criteria processed by the validator. The validator was carried out by 2 people from Jember University lecturers and 1 person from the compulsory mathematics subject teacher at SMA Negeri 1 Panji |
| 2  | Practicality     | Practical criteria can be see from the results of the assessment of the           |
3 Effectiveness

Learning tool is said to be effective if the student response questionnaire and from the data analysis of the student learning outcomes test.

4 Students' Creative Thinking

This study also measures whether there is an effect of the resulting tool on students' creative thinking abilities, which can be seen from the results of the students' creative thinking ability tests and fulfills the creative thinking criteria set by the researcher.

Population of this study is class X Mipa which consists of 6 classes with a total of 35 students for each class. As for the sample used in the study were 2 classes, those are class X Mipa 1 as the experimental class and X Mipa 3 as the control class, and for the sampling method using cluster random sampling method where the sample was taken randomly [26].

Research design for the experimental and control classes were both given a pretest then given treatment and then given a post test to measure the effect, a more detailed process can be seen in figure;

Population in this study was class X which consisted of 6 classes for quantitative research. The sample used was 2 classes, namely class X Mipa 2 and X Mipa 3 which were taken randomly using cluster random sampling method for X Mipa 2 given treatment according to the title of the researcher. for X Mipa 3 was given treatment according to the process the teacher used to do. The following experimental research design in this study can be seen in Table 2 below.

| Experimental Class | Control Class |
|--------------------|--------------|
| Pretest            | Pretest      |
| LSLC               | Conventional Learning |
| Observation        | Data Analysis |
| Interview          | Discussion   |
| Post test          | Conclusion   |

**Figure 1. Research design**

Data analysis of students' creative thinking abilities includes different levels based on aspects of fluency, flexibility, and novelty [25]. The normality and homogeneity assumption test is carried out first before the data is analyzed.
3. Result and Discussion
This research generates learning tools that are valid, practical, effective, and can be used seeing theirs effect on students' creative thinking. The process of developing learning devices begins with a defining stage which aims to obtain information about students' condition, then proceed to the design stage. At this stage it is implemented compiling tests, selecting media, selecting formats and making initial designs. After the design stage is complete, it is followed by the development stage. Development stage is carried out for the first time by obtaining assessment data on the validation sheet which will be carried out by three validators. After learning tool is declared valid, then a readability test is carried out to determine the clarity and suitability of the student's abilities then if there is a deficiency, it is re-validated to the validator, then field trials are carried out in field trials, only 2 meetings are carried out if the development stage is successful then it can continue to the next stage, it is deployment stage. This study uses google classroom media with a display as below;

![Google Classroom](https://classroom.google.com/c/t/1/3GQ5SN5rM4K)

**Figure 2. Displays of google classroom media**

Google classroom media is used by students to discuss with large classes or in one class, for example X Mipa 1, so students can discuss with students in this class by means of the teacher entering the class code for discussion spaces between students. In google classroom, a large group is provided (class room) to discuss in the form of a large group then there are instructions for students to be part of the small group in discussing the available problems (collaborative learning), after getting a solution, the next step is uploading to their respective class groups in the video format explaining the results of the discussion conducted by group representatives. Group division consists of 35 students and made into 4 people per group with students following the various instructions in the google classroom as shown below;
The first process in development is validation to the validator by submitting all the instruments that have been compiled. Using three validators, which are two expert validators from Jember University lecturers and one validator from compulsory mathematics teachers with details on the development of learning tools, validator I 4.7 with valid categories, validator II 4.5 with valid categories, validator III 4.7 categories valid, and for the development of student worksheets validator I with a value of 4.7 in the valid category, validator II 4.5 in the valid category and validator III 4.8 with the valid category, while the indicator for the creative thinking ability test for validator I is 4.6 categories valid, validator II value is 4.6 valid categories and for validator III is 4.7 valid categories are parts of the value of the lesson plan, student worksheets and tests of creative thinking skills. After it is known that the instrument developed is valid, the next step is to analyze the practicality of the instrument. For practicality analysis, it can be seen from the results of observations of the implementation of learning tools. More details can be seen in the image below;

**Figure 3.** Display of google classroom media

**Figure 4.** Results of the learning mediavalidation

**Figure 5.** Results of the implementation
The conclusion from the implementation of the tools is that from the 1st to 3rd meetings shows that it is included in the good and very good category of learning tool implementation so that the tool can be said to be practical. After the practical instrument, the next step is to assess the effective part obtained from student response questionnaires, learning test results based on creative thinking and student activities. The student learning outcomes have quite a lot of completeness, with KKM 75 with a percentage of students passing that is 83% of students have completed learning three-variable linear equations. Whereas for the student response questionnaire obtained from the number of students 35 for the results of the distribution of student questionnaires it resulted that many students strongly agreed with the 82% category, agreed 9.6%, quite agreed to 6.8%, less than 1% and those who disagreed only there are 2 people with a percentage of 0.7%.

Based on student activity data at the 1st meeting, students are still 70% active, maybe because they are not accustomed to using Google classroom media but are still in the active category, for the second meeting students increase to 87% so that students are already in the active category at the 3rd meeting the students have increased again due to the habit of discussing using Google Classroom with 90% of the category very active. The results of distributing student response questionnaires and student activities can be seen in more detail in the picture below;

In addition to learning outcomes seen from student work results and observations were also strengthened by the presence of interviews of 3 students, selected students who had high, medium and low scores. This interview aims to find out how students respond to the learning process and what difficulties students face during learning, one example of interviews with high-ability students is as follows;

Researcher : What do you think about the learning that Madam apply?
Student : It's fun, I think, because with group learning, I feel more confident and happier to sharing with friends.
Researcher : What difficulties that you face during group learning?
Student : Because of the learning from now on, sometimes there are friends who cannot directly participate in discussions and the timeframe for discussions can be very long.
Researcher : Based on these difficulties, do you still like learning at this time?
Student : I really like it because on the other hand we have a lot of time to discuss, it is different than when the effective learning as usual.

Researcher : What are your efforts when one of your group friends cannot join the discussion forum
Student : Keep calling until they are active, because with a lot of discussion with friends, you can gain a lot of knowledge because there will be an exchange of opinions.

Researcher : Try to describe your process in a group discussion in solving the problem?
Student : Because at the moment held by full online so we can only take photos of each other, for example to synchronize our opinions in making variables, we take photos of our work and discuss with group friends and look for conclusions that we will use, sometimes we disagree but we have to respect each other and find for the best solutions.

Researcher : What do you think about the given student worksheets?
Student : The worksheet is good and interesting because it is full color and lots of pictures.

Researcher : Have you been helped by the LKS in understanding the SPLTV concept?
Student : It is very helpful because it is complete with the steps that we are going to do.

After the research instrument is said to be valid, practical and effective in qualitative research methods, the research can be continued in the experimental and control class to conduct research on its effects on students' creative thinking.

**Experimental Research**

Experimental research uses 2 classes, namely for classes that are given treatment according to research, namely class X Mipa 2 and for classes that continue to use their learning, the teacher is usually X Mipa 3 and for the two classes are given a pretest first which functions to determine the students' initial abilities then X Mipa 2 was given treatment with instruments made in the experimental class for the control class was given treatment by to the design as is usually used by teachers of compulsory mathematics.

Based on research results of data that obtained through pretest, posttest in X Mipa2 and X Mipa3 classes and then the next step is to do normality test as the main requirement in the next test [27].

| Class | Kolmogorov-Smirnov\(^a\) | Shapiro-Wilk |
|-------|-----------------|-------------|
|       | Statistic | df | Sig. | Statistic | df | Sig. |
| Mathematic Learning Result | Experimental pretest | .142 | 35 | .073 | .952 | 35 | .130 |
|       | Experimental posttest | .147 | 35 | .052 | .955 | 35 | .161 |
|       | Experimental pretest | .126 | 35 | .177 | .941 | 35 | .062 |
|       | Experimental posttest | .132 | 35 | .125 | .967 | 35 | .376 |

\(a\). Lilliefors Significance Correction

The principle for normality decision making if Sig> 0.05 then the data is normally distributed so, that the data can be used with the independent t-test. Independent test of t-test was carried out by comparing the pretest results in experimental class to the pretest scores in control class, for the pretest test resulting values as the following table;
Table 4. Result of t-pretest test

Independent Samples Test

| Levene’s Test for Equality of Variances | t-test for Equality of Means |
|----------------------------------------|-----------------------------|
|                                        | F  | Sig. | t   | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |
| Mathematics Learning Result             |    |      |     |    |                |                 |                        |                                        |
| Equal variances assumed                 | 1.295 | .259 | -.394 | 68 | .695 | -.686 | 1.741 | -4.159 | 2.788 |
| Equal variances not assumed             | -.394 |       | 66.119 | .695 | -.686 | 1.741 | -4.161 | 2.789 |

Result of Independent t-test calculation from the sig. (2-tailed) with the principle of decision making if <0.05 between the control and experimental classes then in this study sig. (2-tailed) with a value of 0.695 means that there is no significant difference, so treatment can be implemented to compare students' post-test scores. After treatment in the experimental class with tools that have been created and managed using tools that are normally used by teachers of mathematics subjects, this Sig. (2-tailed) 0.000, so there is a difference between the classes that are given treatment and those using the commonly used devices are accepted and $H_a$ is rejected.

Table 5. Result test on post-test

Independent Samples Test

| Levene’s Test for Equality of Variances | t-test for Equality of Means |
|----------------------------------------|-----------------------------|
|                                        | F  | Sig. | t   | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |
| Mathematics Learning Result             |    |      |     |    |                |                 |                        |                                        |
| Equal variances assumed                 | .149 | .700 | 71.61 | 68 | .000 | 11.971 | 1.672 | 8.635 | 15.307 |
| Equal variances not assumed             | 71.61 | 67.866 | .000 | 11.971 | 1.672 | 8.635 | 15.308 |

Based on the outcomes of analysis of quantitative data, the creative thinking abilities of the students were higher in the experimental class than those in the control class. This is because learning of experiment class uses learning tool based on lesson study for learning community that has been developed while in control class learning uses student worksheets provided by school. Activity of asking and explaining in collaborative process, however the learning process in control class were students are less active and less involved in learning that is explained in detail in the following figure;
This study aims to assess the creative thinking abilities of students by complying with 3 creative thinking metrics of students, which are fluency, versatility and novelty. Fluency can be complied if students able to make model of equation into two-variable linear equations, flexibility indicators are complied if student can mention alternative solutions, and novelty is complied if student can provide new ideas in solving problems. Answers of students who meet the 3 indicators of creative thinking skills as follows;

Figure 8. Learning process

Figure 9. Student results based on flexibility aspect
Picture above shows that students can answer in many ways either by elimination, substitution and by combined methods with the same results for each variable.

![Image 1](image1.jpg)

**Figure 10.** Student results based on fluency aspect

Picture above shows that students can solve the questions / problems given with the problem in the money section of Rp.1,700,000 with maximum conditions meaning that students can spend all of the money or even leave apart according to the student's needs.

![Image 2](image2.jpg)

**Figure 11.** Student results based on novelty aspect

After students can use elimination, substitution, and mixture solutions, students are required to find other methods. This method is not taught in teaching and learning activities in the classroom. Researchers do to find out students' creative thinking skills in terms of novelty or novelty aspects. It turns out that after looking for alternative methods through searching the internet, asking teachers or other people they have a method with the multiplication system.

Development process that is implemented in the face of the current pandemic period, the use of social media focuses on so that learning uses full online. The media used is in the form of existing media, namely the google classroom, it's just designed in such a way that it can be used in addition to mostly leading to a place to collect assignments in order to save time [28][29] in this study it is used for collaboration between students, learning in groups remains intact. well and caring for each other between students still occurs even though it has been mitigated by a pandemic like today. This learning tool is also used to determine the effect on students' creative thinking in more detail in the following diagram;
Figure 12. Relation between tool and students' creative thinking abilities

The process of developing lesson study for learning community-based tools has some that distinguish including using an approach in the learning process and assisted by google classroom media which is different from previous research [28][30] in addition, this development is also carried out to determine the effect on ability students' creative thinking. The research was carried out online in implementing learning in terms of collaboration, community and jumping tasks, all using menus that are already available in the google classroom, research, such as the use of google classrooms in teaching, has been developed[31].

4. Conclusions
Based on the results of research conducted at SMA Negeri 1 Panji with a sample of X MIPA 1, it can produce valid, practical and effective learning tools. The research was conducted with a full online learning process and everything was arranged using google classroom media using developments from Thiagarajan.

The results of experimental research using the independent t-test at the pretest resulted in a sig. (2-tailed) value with a result of 0.695 so that it can be concluded that there is no important difference and can be continued with treatment with research instruments and obtained post-test values with the t-test. Test at sig (2-tailed) 0.000, the lesson study for learning community based learning tools using google classroom media have an impact on students' creative thinking skills.

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