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Implementation of integrated inquiry collaborative learning based on the lesson study for learning community to improve students' creative thinking skill

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Abstract. Creative thinking skill is very important in the era of industrial revolution, especially in the 21st century. Since everyone must have 4C (Creative, Critical thinking, Communicative, Collaborative). However, it is still far from the expectation that students are having this skill. Therefore, in this research, we examined the application of integrated Inquiry-collaborative learning based on Lesson Study for Learning Community to improve students' creative thinking skills. The used method was classroom action research, with two variables linear system as the material in class VIII E MTsN 5 Jember in the odd semester of 2018/2019 academic year. Students' creative thinking skills were measured by essay tests. Data were obtained through the test results of learning, observation, interview, and the results of students' activities during the learning of integrated inquiry-collaborative learning based on Lesson Study for Learning Community. The average pre-test result of the two variables linear equation system was around 22.33%. While the average post-test results turned out that the number of students who think creatively increased. This means that in the first cycle students experienced an increase in creative thinking. This shows that integrated inquiry-collaborative learning based on Lesson Study for Learning Community can improve students' creative thinking.

1. Introduction

Think creatively one component of 4C *(Creative, Critical thinking, Communicative, Collaborative)* [1, 2]. 4C mastery as a tool to achieve success, especially in the 21st Century, a century where the world developed very quickly and dynamically is very important. 4C is a type of soft skill that in daily implementation is far more useful than just hard skill. Creative thinking can be developed through matehematics to encourage students to become individuals who can think critically, creatively, logically and systematically in solving problems and also to equip students who are needed in the era of globalization.

The interesting topic that i raised in this article was motivated by the condition of the MTsN 5 Jember students who had very low intakes. Their creative thinking skills are minimal compared to abilities in the fields of sports and art. One of creative thinking skill is the Two Variable Linear Equation System with open ended questions. The probelem which generally occured were the students still haven't experienced a meaningful learning process, students' ability in creative thinking has not

been honed yet, and there was no emergence of collaborative activities among students so that students tend to be individuals and have not yet emerged caring for their friends who have learning difficulties. Learning activitities need to use principles, such as: student-centered, develop students' creativity, creating intersting and challenging condition, covering value, ethics, aesthetics, logic, and kinestetics, and provide a diverse learning experience through the application of various learning srtategies and methods which surely joyful, contekstualeffective, efficient, and meaningful. Based on the steps activities contained in integrated inquiry collaborative learning is one of the learning approaches where they learn to use contectual problem to get meaningful knowledge. So that they are able to master the knowledge and skill together. Whereas learning tools for Learning Study is lesson study based on collaborative and learning community [3]. In this case, the objective of learning community is that the students learn from each other (listening to each other), and the teachers must also learn from each other [8]. Besides that, LSLC-based learning is given jumping task, which is a task above the 2013 Curriculum requirements for students with above average abilities to improve the ability to think creatively with open ended questions.

Based on the problems described earlier, it is necessary to develop learning tools with integrated inquiry-collaborative learning based on Lesson Study for Learning Community to improve students' creative thinking skills. This learning is carried out in several stages, namely: (1) Identifying questions or problems, (2) making hypotheses (3) collecting data (4) testing the hypothesis (5) generalizing.
Inquiry-collaborative learning based on Lesson Study for Learning Community was carried out collaboratively between teachers and other teachers (plan, do, see), students and teachers, as well as between students, with a high level of care and all students get attention. Fluency, flexibility, and originality are part of the creative thinking skills contained in the Lesson Plan, Student Worksheet and Achievement Test.

This research is certainly different from previous researches. A research conducted by Andini, et al. [4] aimed to describe the activities of students in a two-variable linear equation system using Problem-Based Learning (PBL) with LSLC in SMP in Banyuwangi Regency. A research conducted by Hobri, et al. [5] aimed to developing mathematics learning tools through Contextual Teaching and Learning (CTL) based on LSLC on the material sequence and series of the tenth grade student at Vocational school and to know their influence towards students high level thinking skills. A research done by Mahbube Keihaniyan [6] aimed to see the relationship between collaborative learning and motivation. A research conducted by Weerasuk Kanauan [7] aimed to collaborate between Civil Servant Teachers and Internship Students in Lesson Study in Thailand. A research conducted by Santoso, F.G.I and Nurul, H.A, et al [1, 2] aimed to determine the percentage of mathematical creative thinking skills of junior high school students in Teaching and Learning process. The purpose of this research was to implementation of integrated inquiry collaborative learning based on Lesson study for learning community, the subject of a two-variable linear equation system for eighth grade students and know their effects on students' creative thinking skills.

2. Research Methods

The method used in this research was a qualitative and quantitative approach. The design used is classroom action research. Quantitative data is collected first, followed by qualitative data that explains findings from quantitative data (for example, after assessing pragmatic competencies at the group level, following up on some participants to gain an understanding of their characteristics and also applying this model to their research. Quantitative research analyzes learning outcomes students after applying the integrated Inquiry learning method Collaborative Learning Based on Lesson Study for Learning Community To Improve Students' Creative Thinking Abilities Then qualitative research aims to analyze data from the observations and interviews of selected students.This study investigates two variables, namely the application of integrated Collaborative Learning Inquiry learning Based on Lesson Study for Learning Community as an independent variable and Student Creative Thinking as the dependent variable [13, 14].

In this design, there are six class groups where each is heterogeneously selected based on high level, sufficient and lacking ability. Before the research was conducted, students were given a pre-test to find out their initial situation. During the study, class VIIIE was treated as an experimental group. Then, at the end of the study, students were given a post-test to see how the results. This design is used to see the effect of treatment (independent variable) on the change / increase in the observed dependent variable.

Learning tools mentioned are Lesson Plan, Student Worksheet and Learning Outcomes Test and validation of the research instruments was also carried out namely observation sheet of student activities, observation of the implementation of learning devices, open class observations and student response questionnaires.Learning devices and research instruments could have been used if they had been declared valid. If they were not then they would have been revised as suggested and input from the validator.

2.1. Population

The research was done to the eight grade student of MTsN 5 Jember in the odd semester of the 2018/2019 academic year. The sampling tehnique used in random sampling by randomly selecting one class. The VIIIE class was the experiment class with the implementation of inquiry-collaborative learning based lesson study for learning community which was consisted of 24 students. The data was obtained from October up to November 2018 at VIII E class by using purpose sampling technique based on the most different answer.

2.2. Instrument

The schema model used is the Hopkins model, which is a schema model that uses work procedures which are seen as a spiral cycle of planning, action, observation, and reflection which is then followed by the next spiral cycle (PGSM Project Training Team, 1995: 5) [11]. The four stages in each cycle can be seen in Figure 1 below.

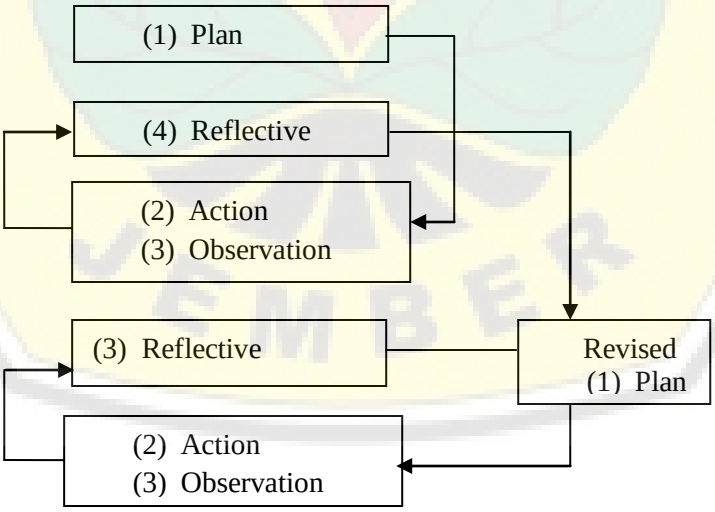


Figure 1. Hopkins Research Model

The instruments used in this research had been validated by two lecturers of FKIP Mathematic of Jember University as well as a teacher practitioner from MTsN 5 Jember and it was valid. The validity test that was done was learning material development which covered Lesson Plan, Student Worksheet, and Achievement Test. The device is the result of collaboration with validators and class VIII math teachers at MTsN 5 Jember(Plan) that was in the form of suggestions based on their own experiences during teaching mathematics especially on System of Linear Equations in Two Variables. Where, pre-test and post test were used in Achievement Test to measure students' creative thinking skill in order to obtain the data about students' creative thinking skills in VIII E class. In addition to learning

devices, validation of the research instruments was carried out, namely the observation sheet of student activities, observation of the implementation of learning devices, open class observations, and student response questionnaires.

2.3. Questions

Open ended questions used in Achievement Test of this research were presented as in Table 1.

Table 1. Open ended questions used in Achievement Test

Question Type	Question	Creative Thinking	Description
Essay	Maulidiah buy a book and two pencils and she has to pay 7.000 rupiah while Raihany buy four books and three pencils as much as 18.000 rupiah. If Hafir is given 50.000 rupiah, how many book and pencil he would get?	Fluency, Flexibility, Originality	In this question the students are asked to solve an open ended question in solving System of Linear Equations in Two Variables material (there are 9 alternatives that could be bought by Hafir)
Essay	Asep buy 2 kilos zalacca and 1 kilos orange, he has to pay 15.000 rupiah, while Intan buy 1 kilos zalacca and 2 kilos orange as much as 18.000 rupiah. If Abim is given money as much as 50.000 rupiah, how many zalacca and orange he would get?	Fluency, Flexibility, Originality	In this question the students are asked to solve an open ended question in solving System of Linear Equations in Two Variables material (there are 8 alternatives that could be bought by Abim)

3. Research Finding

3.1. The Result of Data Analysis

The validation results from the expert are presented in the following Figure 2.

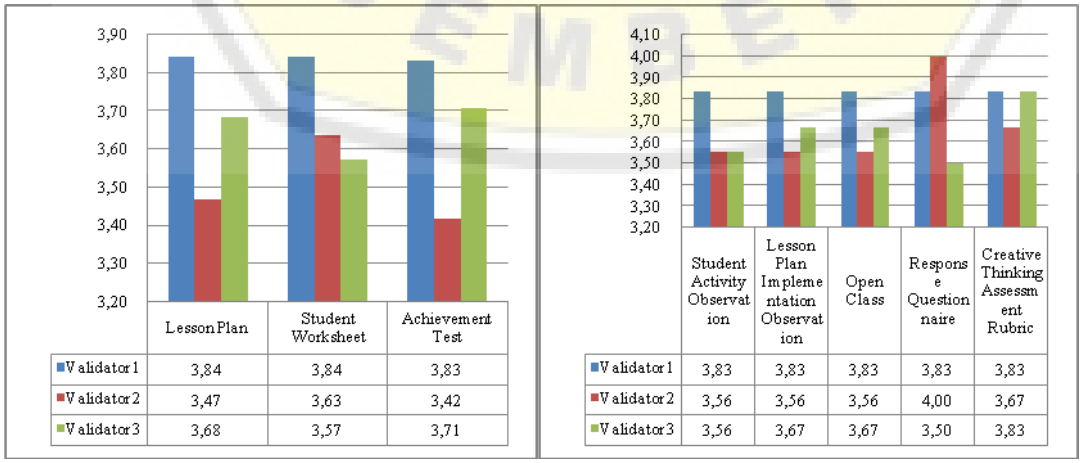


Figure 2. The Validation Result of the Learning Material and Research Instruments

The material and instruments were stated as valid if the validity average value $(\bar{V}_r)$ was in the interval $3 \leq \bar{V} < 4$. From Figure 1, it was shown that the validation result of the material and instruments of the research from three validators could be said as valid. Therefore the learning material and the research instruments could be used in this research.

Then, "Do" stage that was integrated inquiry collaborative learning based on Lesson Study for Learning Community done in VIIIE MTsN 5 Jember in Systems of Linear Equations in Two Variables was done. This research was conducted six times meeting with 4 treatments in which the pre-test and post test was administered in the first and last meetings.

In the first meeting, *pre-test* consisted of two questions was finished in 80 minutes. The result of pre-test was used to measure students' creative thinking skill before the learning was conducted. The students' pre-test result was shown in the following Table 2.

Table 2. Students' Creative Thinking Skill based on pre-test

	Description
Highest Score	57,5
Lowest Score	10
Average	42,62
Standard Deviation	13,29

In the VIIIE class, the treatment was given in the form of LSLC-based inquiry-collaborative learning which was done at the 2nd to 5th meeting. In the learning activities, the students made groups consist of 4 students to collaborate in their groups. The learning was conducted in some stages that were; (1) Identifying question or problem, (2) generating hypothesis, (3) Collecting the data, (4) Testing hypothesis, (5) Generalizing. During the group discussion activities, students collaborated with each other so thet there was no friend in the group who felt neglected, on the contrary, there was a caring community.

In constructing and finding, the students were guided to think individually beforehand and then collaborated with others in a group without ignoring any friend (*caring community)*. In the LSLC based learning, it was assumed that every student is accepted and cared no matter their situation, belief, or weakness they have [10]. Similarly, in the *assessment* stage, the students were given some exercises with creative thinking level for *open ended* question and the activities was done in a collaborative and caring community. This is in line with Masaki Sato [3] who states that the children social interaction ability is the first development and then followed by academic ability development of each child. The teacher as the facilitator should give scaffolding to the group who need it.

In the VIII E class, the students work together, asking question to each other and the caring sense grown among friends. The students' activity of questioning and explaining in group was presented in the following figure by taking one group as a sample.

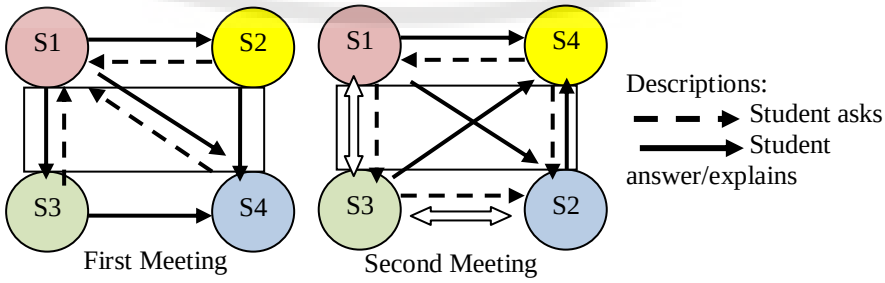
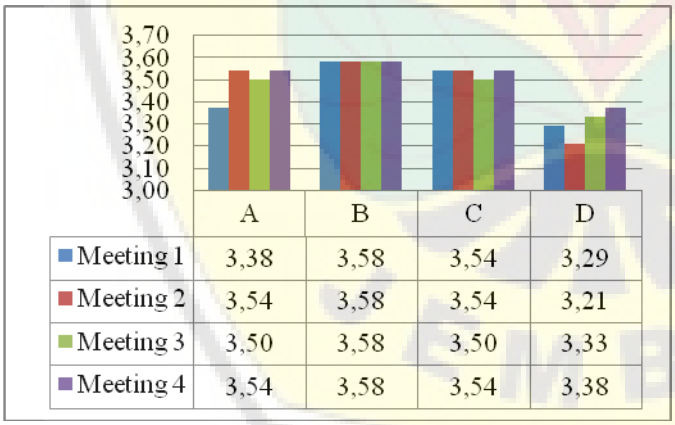


Figure 3. Group Discussion Activity in Class VIII E

Based on Figure 3 above, it seemded that in the VIIIE class, all students involved in collaboration process in finishing students' worksheet. The students were courage to ask if there was

a material they did not understand and, in reverse, the students who understood the material helped their friends who still struggling. During the group discussion, there was one quiet student that was student 4 who did not understand the material so that his three friends helped to give explanation about the material. One of the interaction forms in the experimental class during the discussion of students' worksheet 3 was a student 2 asked student 1 related to the equivalent form in algebra $x+2y=500.000$ became $x=500.000-2y$, then student 2 answered the $x+2y=500.000$ should be changed into other equivalent form that was x equal which had purpose to ease the substitution process into other mathematical sentence form, Students 2 seemed unsatisfied with student 1 answer so student 4 gave other explanation if only $x+2y=500.000$ was changed into other equivalent form which is certainly allowed but later on it would be a decimal form which would be too long to be counted. Finally, student 3 convinced student 4 answer by saying that surely it much easier to change the sentence $x+2y=500.000$ to be $x=500.000-2y$ by inviting student 4 to try finished it. Student 4 became more understand about the material from caring community process in his group. By applying this caring community process, the students who did not understand and less courage to ask, finally, became enthusiastic lo ask his group. In LSLC context, the essential part is giving students a chance lo ask for help and other students give positive response [5, 12, 13].

Students' activity observation in the VIIIE class covered students' activity in giving attention to the teacher or friend explanation, questioning or reasoning as well as discussing, finishing group task and presenting it in class. The results of the students activity observation in the VIIIE class showed that, from 24 students, there were 25% students was categorized as very active, 58,33% students were active, and 16,67% students were less active. The students' activeness was shown in the Figure 4, as follows:



	A	B	C	D
Meeting 1	3,38	3,58	3,54	3,29
Meeting 2	3,54	3,58	3,54	3,21
Meeting 3	3,50	3,58	3,50	3,33
Meeting 4	3,54	3,58	3,54	3,38

A : Student's activity in asking or giving Explanation to their friend
B : Student's activity in cooperating with the group
C : Student's activity in doing and expressing opinion
D : Student's activity in presenting or responding the results of group discussion

Figure 4. Results of the Students' Activities

The open class activity, which had been attended by 12 teachers of various lesson subject in MTsN 5 Jember, conducted in the second and forth meeting. This activity incorporated many teachers as the characteristic of more effective teacher rofesional development. Open lesson was one of LSLC activities in which in see stage contained reflection activity based on the observation result in the class. The stage was founded on the observation of how students learned in group while the observation of teacher's activity during learning was only used as sugegestion in learning activity. Some teachers of different subject were interested in implementing LSLC in their lesson. This was because in the VIIIE class, students seemed to could collaborative and had high sense of care to their friends [8, 9]. In LSLC-based inquiry collaborative learning, the student became easy to get meaningful knowledge and improve activeness, creativenes, argumentative on discussion skills. The teacher of open class believed that LSLC-based inquiry collaborative learning would be able to improve students creative thinking process because, during learning, the students really experienced

meaningful learning within their group. Post-test was done in the last meeting to find out the students' creative thinking skill after joining the learning process. The post-test result was presented in the Table 3.

Table 3. Students' Creative Thinking Skills Based on the Results of Post-Test

	Description
Highest Score	100
Lowest Score	75
Mean	92,61
Standard Deviation	9,75

Data analysis to know the effect of integrated *inquiry-collaborative learning* based on LSLC. Based on the results of test analysis of the 24 students' learning results, there was no students who got score less than 75 from a maximum of 100, students passed individually, so that it obtained the passing percentage of the students reached 100% classically.

In this research, the indicators to measure the student's creative thinking skill were based on the statement by [1]. In the Figure 5, it was shown the students' answers of the creative thinking skill by expressing three indicator (fluency, originality, flexibility).

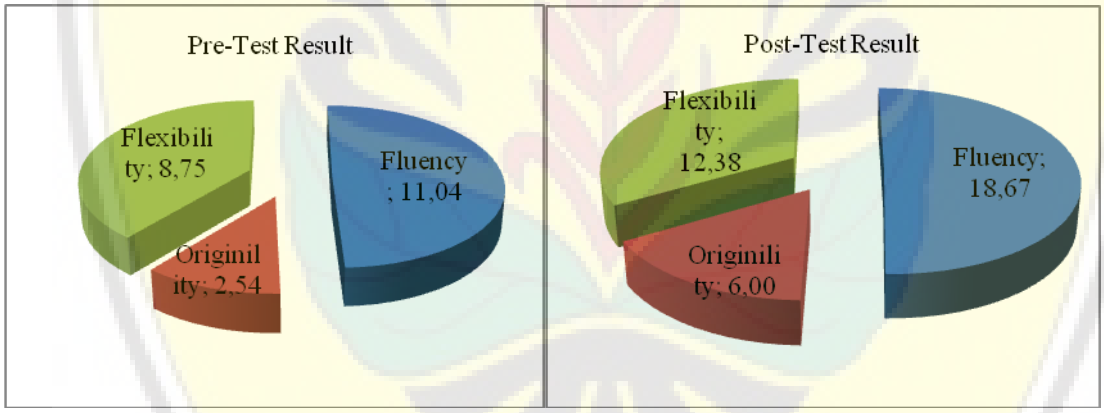


Figure 5. The results of the pre-test and post-test Creative Thinking Skill Based on the Indicators

The result analysis of fluency aspect was categorized as moderate with the mean score of 11.04 from 24 students, so that it could be said that the students' ability in expressing answers/ideas toward certain mathematical problems was quite well. While, the mathematical creative thinking ability level for flexibility aspect was low, with the mean score of 8.75 from 24 students, therefore it could be said that the students' ability in expressing varying answers or ideas or changing other way of thinking was still low. Besides, the level of mathematical creative thinking ability for originality aspect was categorized as very low, with the mean score of 2.54 from 24 students so that the originality of arranging new ideas or answers was still very low.

The analysis result of post-test for fluency aspect was high with the mean score of 18.67 from 24 students, therefore it could be said that the students' ability in expressing answers or ideas toward certain mathematical problems was well. While, the mathematical creative thinking ability level for flexibility aspect was moderate, with the mean score of 12.38 from 24 students, therefore it could be said that the students' ability in expressing varying answers or ideas or changing other way of thinking was moderate. Besides, the level of mathematical creative thinking ability for originality aspect was low, with the mean score of 6.00 from 24 students so that the originality of arranging new ideas or answers was still low.

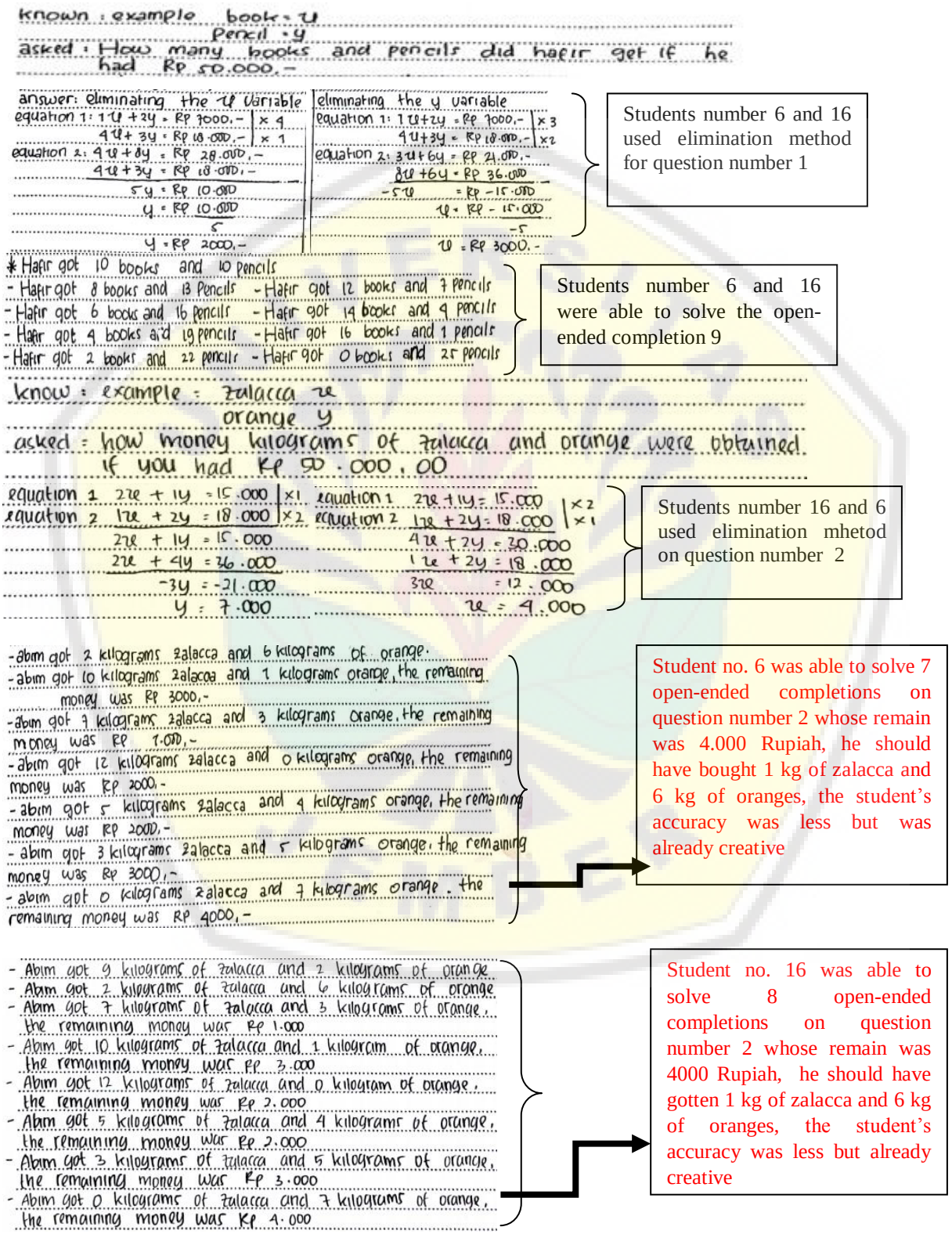


Figure 6. The Answers of High-Level Students Who Possess the Ability to Think Creativity with the Elimination Method.

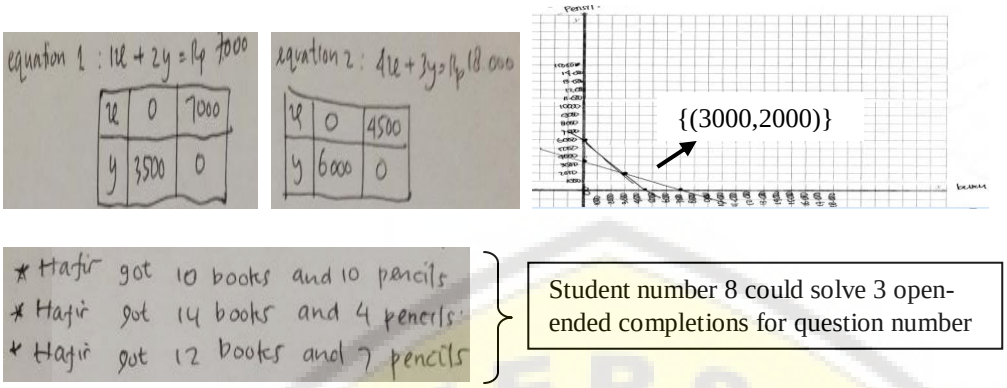


Figure 7. The students' answer with moderate level who have the ability to think creatively by using graph method

Students with low-level thinking skills had been able to possess three indicators (fluency, originality, flexibility). It determined the set of SPLDV finished through only 1 open ended solution covering 10 books and 10 pencils for question number 1. Meanwhile, the problem number 2 was done through 1 open-ended solution was 9 kg of zalacca and 2 kg of oranges. It should be stimulated to possess creative thinking.

To find out the students' perceptions of the implementation of integrated *inquiry-collaborative learning* based on LSLC, in-depth interview was carried out on two students from grade VIII E of MTsN 5 Jember. The result of interview was cited as follows:

"... Classroom learning is enjoyable, making us, the students, eager to learn, especially when we are working on open ended exercises. The problem is challenging to do ..." (S1).

"... The given open-ended exercise is challenging, but the time given to finish the exercise is not enough Moms ... dizzy and tired ..." (S2)

The difficulties faced by most of these students indicated that the open ended learning has not been widely applied in mathematics learning in a classroom. Based on the research of several experts, open ended learning is able to develop students' thinking skills till its maximum and stimulate the students' creativity as the general objective of mathematics learning. During the interview section with the students, almost all students admitted that they just had an open-ended question which required many answers or many ways of solving. In classroom learning, most math teachers never give them open ended questions, the teacher only provides a single and definite solution. Open ended questions are still rarely used at schools since it is difficult to make open-ended questions and not all mathematics material can be used to compose open ended questions. In addition, it requires a lot of time to work on the problem because of open-ended questions as it has many answers or ways of solving so that the teacher uses more problems with a single and definite answer.

4. Disscusion

The findings of learning mathematics using inquiry integrated LSLC-based collaborative learning have been fulfilled. This is indicated by: (1) the average score of class VIII E pre-test of 42.62 increased by 92.61 after the post test where students completed classically in the material system of two-variable linear equations, (2) the activity of students when they are putting themselves on lesson was very high, (3) There was a significant increase on mean score of creative thinking skills in class VIIIE. The results of the observation showed that the implementation of learning ran well with the average of 3.70 on each aspect. The results of the student response questionnaire of more than 93.75% of students gave a positive response on learning instruments and implementation of integrated *inquiry*-collaborative learning based on LSLC. Thus, the practicality test for instructional instruments reached the criteria, which were: (1) the implementation of learning was classified to good category and (2) students responded positively to learning instruments and implementation of integrated inquiry-collaborative learning based on LSLC.

5. Conclusion

Learning by using integrated *inquiry-collaborative learning* based on LSLC is found to be effective to improve the students' creative thinking skills. Students can learn by interacting with each other and helping each other in solving the problems that have less creative thinking skills. Teachers must be open so that they are able to provide an opportunity for all students to find and share their various ideas they get and the teacher must be able to help students if they have difficulty in creative thinking. The students who take part in teaching and learning activity as well as the teachers who participate in open class activities which gives positive response to integrated inquiry collaborative learning according to LSLC.

For further researchers, a similar research can be tested on the students with different levels of education, material, and learning models without removing the main characteristics of this learning based on *Lesson Study for Learning Community* (LSLC).

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