

The Effectiveness of Community of Inquiry Learning and Learning Styles Towards Students' Concept Mastery

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Abstract

This study was conducted to identify whether there was a positive effect of the Community of Inquiry learning and learning styles on students' concept mastery. The samples involved were 113 students, consisting of 56 students for the experimental group and 57 students for the control class. This research was a quasi-experimental design. The results of this study concluded that there was a significant difference in the concept mastery of the students who used the Community of Inquiry learning compared to the group of students who used cooperative learning. Besides, there were significant differences in concept mastery of students taught using the community of inquiry learning compared to those taught using cooperative learning in terms of student learning style visual, auditory, and kinesthetic. There was no infection of the use of community of inquiry learning with cooperative learning and learning styles on students' concept mastery.

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INTRODUCTION

The development of Science, Technology, and Art has substantially changed the world of education today. The challenge of improving the quality of education must be in line with technological developments and the progress of society, which has significant implications in educational programs. Achieving educational goals must be supported by a good educational system and learning patterns following technological developments and the comfort of services and academic environment. Furthermore, such good educational system and learning patterns can lead to improving the quality of graduates, both in theory and practice. A comfortable academic environment and adequate technological facilities will help learners to move and study together with their peers. The involvement of students in the learning process both individually and in groups will have a good impact on students' cognitive development and social skills. This statement is supported by research results stating that collaborations between students by utilizing technology gave a good impact on learning outcomes (Yilmaz, 2017; Scott, 2017).

Learning strategies should be selected regarding learning styles and technological developments to create good learning outcomes. In addition, proper learning strategies will create a conducive, active, creative, and meaningful learning condition and help students to understand the material being studied. The use of appropriate learning

strategies will provide both direct and indirect (accompaniment) impacts. According to (Joyce, B. W, 2009), learning outcomes are influenced directly by the learning process referred to as instructional and accompaniment effects related to affective, such as attitudes, social skills, or so-called nurturant effects. The important thing from the above opinion is the learning strategy is truly crucial. Therefore, teachers need to choose learning strategies that involve students actively and utilize a variety of technology-based learning resources, such as the use of community learning, cooperative learning, and collaborative learning as things common in learning at school. Moreover, proper learning strategies can improve students' learning activities and outcomes (Garrison & Vaughan, 2007; Garrison, 2016; Munazah & Nugroho, 2015)

A teacher is one of the key factors for success in learning. Teachers are required to play an active role in designing and facilitating students always to learn. To produce graduates who have high competitiveness and are ready to compete, teachers should master knowledge and technology, have soft skills, think critically, creatively, and communicatively, as well as collaborate with students (Bell et al., 2010; Ibrahim et al., 2015). In line with this opinion, (Setyosari & Sihkabuden, 2005) stated that teachers should continue to strive to improve the quality of learning through various activities, including increasing commitment to upgrading the quality of learning, making systematic learning designs, and empowering technology and learning media. Based on the above opinion, teachers who master knowledge and technology, as well as take advantage of various sources and learning media could produce good learning processes and produce quality graduates.

The observations in the field found a variety of problems, including the lack of students involvement in the learning process, the minimum use of technological media, the number of conflicts between students, the lack of facilities and infrastructure that support good learning processes, and inadequate learning resources. The students' mastery of concepts is still low, and social skills are not maximally trained in learning. Those problems indicate that the strategy used by the teacher does not meet students' needs, or today's students' characteristics. There are also problems in the students' low participation during lectures, and there have never been questions or ideas related to lecture material (Felder & Brent, 2017; Nasir, 2018). The low level of students' concept mastery and social skills as learning outcomes is a common problem in elementary and higher education in various subjects, one of which is science learning.

One alternative to solve the various needs above is the learning strategy of "Community of Inquiry." This learning strategy is a part of inquiry learning strategies that allow students to investigate and find knowledge with their learning community so that they can achieve learning goals. The inquiry learning strategy is the right strategy in helping students develop social activities and concept mastery (Bell et al., 2010; Coffman, 2017). Through inquiry learning, students can investigate an issue. The inquiry learning strategy in this study was formed in a community to collaborate in solving various problems that the teacher provided related to the subjects being studied (Soysal, 2018). The college learning process places students as adult learners (Eggen, P,

2012; Saputro et al., 2019). Therefore, they need a learning strategy that emphasizes student independence and influences them to share experiences with peers, and also underlines that expressing opinions is not a competition among students (Agustianto & Aminah, 2019).

The Community of Inquiry is a learning strategy that provides space and opportunity for students to investigate the learning community to achieve learning goals (Garrison, 2011; Köyceğiz & Özbey, 2019). In other words, the strategy can influence the mastery of concepts (Pratiwi et al., 2016), improve activities and the students' concept understanding (B. Chen et al., 2017; Feng et al., 2017; Garrison, 2016), and provide opportunities for students to be actively involved in social interactions with other students (Garrison, 2015).

The Community of Inquiry learning has four stages in learning, namely Triggering Event, Exploration, Integration, and Application/Resolution (Garrison, 2015). For more details, the stages are presented in Table 1.

Table 1. *Stages of Community of Inquiry learning*

Stages	Indicators	Learning Activities
Triggering Event	Awakening the students' curiosity and setting questions or problems for investigation.	The initial stage that triggers and arouses students' curiosity and also motivates them to investigate by identifying and recognizing problems.
Exploration	Exchanging and exploring views and sources of information with other students.	Students are required to explore questions or problems by discussing with group friends to solve various problems given by the teacher. Students can take advantage of multiple learning resources and facilities to exchange information both face to face and through technology such as relevant social media.
Integration	Linking concepts through reflection.	Students build the meanings of ideas produced in the exploration phase. Students will begin to connect concepts to new problems.
Application/Resolution	Implementing new ideas and integrating theory into practical things.	At this stage, students act following the theory or knowledge obtained at the exploration and integration stages, and resolve various questions and given problems. This final stage requires an understanding to integrate the learned theories into useable practical things that can be used.

Every student has a different learning style so that the teachers need to design learning strategies by choosing learning strategies that are in accordance with the learners' learning styles. The basic thing that should be considered is how students can actively involve themselves in learning something, interact with colleagues, and utilize technology and various other learning resources. A good learning strategy must also be

able to provide a lot of space and opportunity to explore so that students can construct their knowledge, both individually and in groups, according to their characteristics, by utilizing various existing learning media. According to (Jihad, A & Haris, A, 2009), by involving students in learning based on their characteristics, the learning outcomes will be better. By paying attention to the students' learning styles, they will more easily understand the concepts that will be studied, so that the learning outcomes will increase both cognitively and socially (Awla, 2014; Asiry, 2016).

The Community of Inquiry learning strategy is expected to increase the interactions between students with their environment and learning resources, both in the and outside the classroom, by paying attention to their learning styles, so as to improve the concept mastery in the course of research methods. Based on the above description above, the learning processes in higher educations should be optimized by applying the learning strategy called Community of Inquiry viewed from learning styles as an alternative problem solver related to the students' concept mastery. Therefore, the authors are interested in conducting a study entitled the effectiveness of the Community of Inquiry learning strategy and learning styles on students' concept mastery in the elementary education of Muhammadiyah Bima.

RESEARCH METHOD

This research was a quasi-experimental design. The quasi-experimental design was used because the subjects of this study could not be determined randomly, and the class conditions did not allow to change the class. The use of this research design was to determine the effect of the community of inquiry learning and students' learning styles on students' concept mastery. The design of this study has four groups, namely the two experimental groups and the two control groups. The experimental group was the class used to implement the Community of Inquiry learning, while the control class used cooperative learning as comparison material.

The design in carrying out this research was the pretest-posttest non-equivalent group design stated in Table 1 as follows:

Table 2. Design of Quasi-Experimental Research

Groups	Pre-test	Treatment	Post-test
Experimental	O ₁	X ₁	O ₂
Control	O ₃	X ₂	O ₄

Note: O₁ : The pre-test of the experimental class, O₃ : The pre-test of the control class
 O₂ : The post-test of the experimental class, O₄ : The post-test of the control class
 X₁ : Community of Inquiry Treatment X₂ : Cooperative Treatment

Participants

The total number of students in this study was 113 people in the class IV of elementary education of Muhammadiyah Bima Indonesia. Those 113 students were divided into 56 experimental group students and 57 control group students. The demographics of the research samples are presented in Table 3.

Table 3. Research Samples and Treatment Demographics

Groups	Treatment	Total Students
Experimental	Community of Inquiry	56
Control	Cooperative Learning	57

Data Collection

The data collection technique used in this study is in the form of tests and questionnaires. The validity and reliability of this research instrument was tested. The instrument used in data collection is in the form of a description of the test, amounting to 10 questions to measure the ability of students to master the material that had been studied. Furthermore, the instrument is to collect learning style data using a Likert scale questionnaire that has three choices, namely 'often', 'rarely,' and 'never.' Students who chose 'often' were given a score of 5, and a score of 3 and 1 for those who selected 'rarely and 'never', respectively. The learning style questions consisted 21 items, consisting of seven items in each learning style indicator, namely visual, auditory, and kinesthetic.

Analysis of Data

The data were analyzed using descriptive and inferential statistics. Several tests were carried out as the prerequisite tests used to determine the normality and homogeneity of the data so that the type of hypothesis test used could be determined. The normality test was used to determine whether the obtained data were normally distributed. This test was carried out using the SPSS 24.0 for the Windows program at the significance level of $\alpha = 0.05$. The data homogeneity test was done to find out whether the data had a homogeneous variance. The test was executed by employing SPSS 24.0 for the Windows program at the significance level of $\alpha = 0.05$. Decision making was undertaken by looking at the significance level. If the significance level obtained was <0.05 , it would be decided that the data were not distributed homogeneously, and if the significance level obtained was > 0.05 then the data were homogeneously distributed.

Hypothesis testing was conducted in this study to find out whether there was a significant difference between the concept mastery of students taught by using the learning strategy of the community of inquiry and the concept mastery of those treated by using cooperative learning strategies. The significant difference in the students' concept mastery was viewed from the students' learning styles. The data analysis

technique used in this study was Univariate Analysis Of variat statistical analysis technique assisted by the SPSS Version 24.0 program with the significance level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

The recapitulation of the pretest results regarding concept mastery between the group of students treated with the Community of Inquiry learning and the group of students taught with Cooperative Learning strategy is presented in Table 4.

Table 4. *Results Pre-Test of Concept Mastery Based on Learning Styles*

Learning Style	Experimental Group			Control Group		
	Mean	Stdev	n	Mean	Stdev	n
Visual	76.6	4.7	16	74.2	4.0	13
Auditory	75.7	5.1	21	73.8	4.9	21
Kinesthetic	76.1	5.7	19	75.2	6.2	24
Total Mean	75.9	5.4	56	74.5	5.6	58

Based on Table 4, the results of the pre-test of the concept mastery in the experimental class using the community of inquiry learning strategy showed that the students with visual learning styles obtained an average score of 76.6, with a standard deviation of 4.7. Besides, the students who had auditory learning style attained an average score of 75.7, with a standard deviation of 5.1. Meanwhile, the students who had kinesthetic learning styles achieved an average score of 76.1, with a standard deviation of 5.7. Furthermore, in the results of pre-test of concept mastery in the control class using cooperative learning strategies, the students who had visual learning styles obtained an average score of 74.2, with a standard deviation of 4.00; the students who had auditory learning style attained an average score of 73.8, with a standard deviation of 4.9, and the students who had kinesthetic learning styles achieved an average score of 75.2, with a standard deviation of 6.2. More details information can be seen in the figure below:

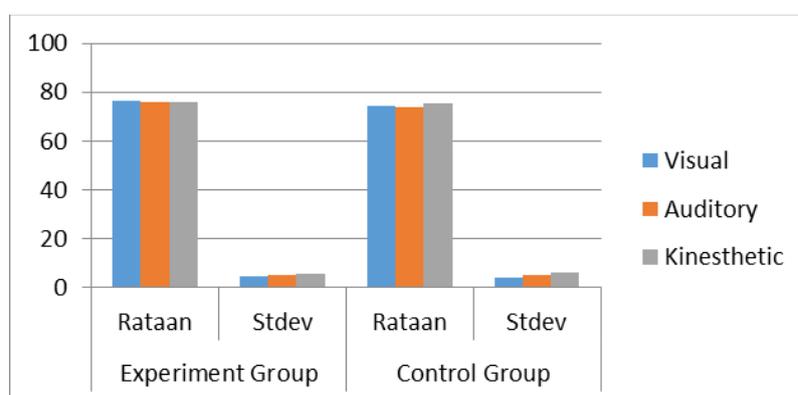


Figure 1. *Results of Pre-Test of Concept Mastery Based on Learning Styles*

Based on figure 1, by looking at the overall results of the pre-test, there was no significant difference in concept mastery of students who had visual, auditory, and kinesthetic learning styles, both in the experimental and control classes. This case also illustrated that the initial ability of the study samples was not different, both from the dimension of learning styles and students' concept mastery in both groups. The results of the post-test of concept mastery based on learning styles can be seen in Table 5 below:

Table 5. *Results Post-Test of Concept Mastery Based on Learning Styles*

Learning Style	Experimental Group			Control Group		
	Mean	Stdev	n	Mean	Stdev	n
Visual	80.0	6.1	16	75.9	4.8	13
Auditory	82.9	4.4	21	77.2	4.9	21
Kinesthetic	86.3	4.4	19	80.4	4.9	24
Total Mean	83.2	5.4	56	78.2	5.2	58

Based on Table 5, the results of the post-test of concept mastery in the experimental class using the learning strategy community of inquiry demonstrated that the students with visual learning styles obtained an average score of 80.00, with a standard deviation of 6.1. Besides, the students who had auditory learning style attained an average score of 82.9, with a standard deviation of 4.4. Meanwhile, the students who had kinesthetic learning styles had an average score of 86.3, with a standard deviation of 4.4. Furthermore, in the results of post-test of concept mastery in the control class using cooperative learning strategies showed that the students who had visual learning styles obtained an average score of 75.9, with a standard deviation of 4.8. In addition the students who had auditory learning style attained an average score of 77.2 with a standard deviation of 4.9. Meanwhile, the students who had kinesthetic learning styles achieved an average score of 80.4, with a standard deviation of 4.9. More details information can be seen in figure 2 below:

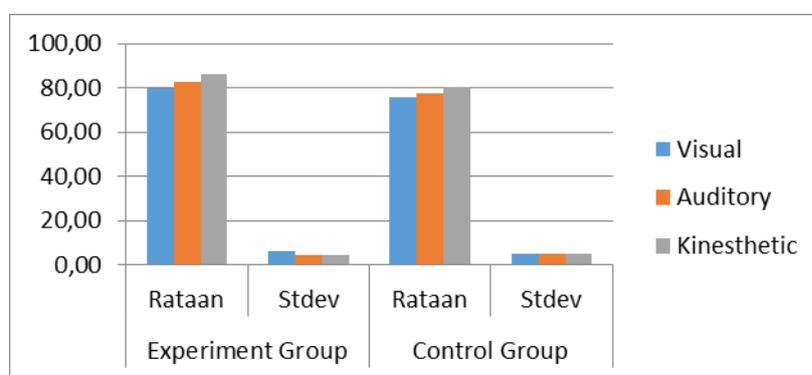


Figure 2. *Results of Post-Test of Concept Mastery Based on Learning Styles*

Based on figure 2, the score obtained in the experimental group was more than > 80.00 and above compared to the score in the control group which was less than < 80. This result explained that the experimental group, by applying the community of inquiry

learning, had a higher score compared to the control group that implemented cooperative learning.

Normality and Homogeneity

The normality test was conducted to determine whether the obtained data were normally distributed. This test was carried out using SPSS 24.0 for the Windows program at the significance level of $\alpha = 0.05$. The data homogeneity test was executed to find out whether the data had a homogeneous variance. The test was carried out by utilizing SPSS 24.0 for the Windows program at the significance level of $\alpha = 0.05$. The decisions were made based on the significance level. If the significance level was <0.05 , then the data were not homogeneously distributed. On the contrary, if the significance level obtained was > 0.05 , then the data were homogeneously distributed.

Table. 6. Results of the Normality test

One-Sample Kolmogorov-Smirnov Test		
Concept Mastery		
N		113
Normal Parameters ^a	Mean	80.68
	Std. Deviation	6.456
Most Extreme Differences	Absolute	.120
	Positive	.078
	Negative	-.120
Kolmogorov-Smirnov Z		1.260
Asymp. Sig. (2-tailed)		.083
a. Test distribution is Normal.		

Based on the data on the normality test results above, both experimental and the control classes were normally distributed evidenced by the value of the experimental group, Sig 0.083 > 0.05 ; the test distribution was normal. Furthermore, the homogeneity of data can be seen in Table 7.

Table. 7. Results of Homogeneity Test of Variance

Levene's Test of Equality of Error Variances ^a			
Dependent Variable: Concept Mastery			
F	df1	df2	Sig.
.881	11	102	.561
a. Design: Intercept + LS + S + LS * S			

Based on the results of homogeneity test of variance, the significance level of the concept mastery variable in the experimental and control classes was 0.561. Because the

value obtained was $0.561 > 0.05$, then, as the basis for decision making in the homogeneity test, it can be concluded that the data variance of the concept mastery in the experimental and control classes indicated that the students were homogeneous or the same.

Hypothesis Test

The data from the univariate analysis of variance in the post-test of the independent variable that is community of inquiry learning strategy, variable moderator that is learning style and the dependent variable that is students' mastery of concepts. If the value of the significance level was > 0.05 , then the null hypothesis (H_0) was received, and the alternative hypothesis (H_a) was rejected. In addition, if the value of the significance level was < 0.05 , then the null hypothesis (H_0) was rejected, and H_a was accepted.

Table. 8 Results of Tests between-Subjects Effects

Tests of Between-Subjects Effects						
Dependent Variable: Concept Mastery						
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	
Corrected Model	1344.033 ^a	11	122.185	5.000	.000	
Intercept	693281.939	1	693281.939	2.837E4	.000	
Learning Style	536.342	2	268.171	10.974	.000	
Strategy	778.686	3	259.562	10.622	.000	
Learning Style * Strategy	85.171	6	14.195	.581	.745	
Error	2492.599	102	24.437			
Total	745970.000	114				
Corrected Total	3836.632	113				

a. R Squared = ,350 (Adjusted R Squared = ,280)

Based on the calculation results presented in Table 9, the value of $F = 10.62$, with a significance level of 0.00. This result suggested that the significance level of $0.000 < 0.05$, then the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted. It means there were differences in concept mastery of the students' taught using the community of inquiry learning from those treated with cooperative learning. This case was reinforced by the average value of students' concept mastery of 83.21 in the experimental group was higher than the average value of 78.24 in the control group. It can be concluded that the concept mastery of the students learning by using the community of inquiry learning was better than those taught with cooperative learning.

Based on the calculation results shown in Table 9, the value of $F = 10.97$, with a significance level of 0.00. This result suggested that the significance level of $0.000 < 0.05$ significance level, and thus the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted., It means there were differences in concept mastery of the students taught using the community of inquiry learning and those

treated using cooperative learning in terms of dimensional visual learning styles, auditory, and kinesthetic. This case was reinforced by the average score of each learning style towards concept mastery, in which the students had differences; the average value of concept mastery of learning styles of the students learning in the experimental group was higher than that of those learning in the control group.

Based on the calculation results demonstrated in Table 9, the value of $F = 0.58$, with a significance level of 0.74. This result suggested that the significance level of $0.000 >$ the significance level of 0.05, then the null hypothesis (H_0) was received, and the alternative hypothesis (H_a) was rejected. It means there was no interaction between the community of inquiry learning and cooperative learning with the learning styles on students concept mastery. These results indicated that there was no interaction between students' learning strategy and learning styles, although both of them separately and similarly gave a significant effect on concept mastery.

Discussion

The first hypothesis test results showed that the significance level of $0.000 < 0.05$, then the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted. It means there were differences in concept mastery of the students taught using the community of inquiry learning from that of those treated with cooperative learning. This result was reinforced by the average value of students' concept mastery of 83.21 in the experimental group, which was greater than the average value of 78.24 owned by the students in the control group. It can be concluded that the concept mastery of the students learning by using the community of inquiry learning was better than that of those learning by using cooperative learning. The analysis results showed a significant difference between students who learned to use learning strategies with a community of inquiry on the subject of educational research methods. The research findings are in line with the opinion of (C. Chen et al., 2018; Garrison, 2019) stating that the learning community of inquiry could improve learner engagement, conduct the investigation together with group, so this particular learning strategy gave impact on social skills and concept mastery. Additionally, opinions of (Asalla et al., 2014; Pratiwi et al., 2016) showing that learning could bring the community of cognitive inquiry presence, which stimulates learners to always learn without being limited by time and space. The community of inquiry learning is suitable to be applied in the era of information and communication technologies like blended learning. Facilities and infrastructure are adequate to develop ways of learning and creative and effective teaching to provide a significant effect on the development of cognitive, affective and psychomotoric aspects,

Based on data analysis and hypothesis test results, the value of $F = 10.97$, with a significance level of 0.00. This result suggested that the significance level of $0.000 < 0.05$, then the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_a) was accepted. It means there were differences in concept mastery of the students taught using the community of inquiry learning from that of those treated by cooperative learning, in terms of dimensional visual learning styles, auditory, and kinesthetic.

Besides, these results portrayed that the use of the community of inquiry could accommodate all dimensions of students' learning styles, including dimensional visual, auditory, and kinesthetic. This case was reinforced by the value of concept mastery of each student's learning style; in the experimental group, the students had average value of the visual dimension of 8.00, while in the control group the student reached 75.92. The mean value of auditory dimension in the experimental group was 82.86., while in the control group it was 77.19. In the experimental group, kinesthetic dimension was 86.32, which was higher than that in the control group, namely 80.42. Those results are consistent with the opinion of (Bire & Bire, 2014) stating that adjusting the learning style would improve learning outcomes. Learning style is a person's way to deliver environmental information or messages to someone who is around; Everyone has different characteristics or learning styles (Awla, 2014). Therefore, a learner should be able to choose the appropriate strategy or accommodate all learning styles, one of which is the community of inquiry learning strategy.

The third hypothesis test showed that there was no interaction between the community of inquiry learning and cooperative learning strategies with the learning styles on students' concept mastery. Based on the calculation results demonstrated in Table 9, the value of $F = 0.58$, with a significance level of 0.74. This result suggested that the significance level of $0.74 > 0.05$, then the null hypothesis (H_0) was received, and the alternative hypothesis (H_a) was rejected. It means, there was no interaction between the community of inquiry learning and cooperative learning with the learning styles on students concept mastery. These results indicated that there was no interaction between learning strategy and students' learning styles, although separately, both of them similarly gave a significant effect on concept mastery. Learning styles and learning strategies simultaneously did not have a significant influence. The results of this study differed from previous research results stating that the learning strategies and learning styles could affect learning outcomes (Bire & Bire, 2014; Halim, 2012). One possible cause of the lack of interaction between learning strategies and learning styles is a learning strategy applied to the control class and experimental classes is equally working groups, which provide an opportunity for discussion and collaboration in completing various tasks of learning. Therefore, such collaboration equally accommodates the dimensions of students' learning styles.

CONCLUSION

Based on the hypothesis test results and the above discussion, it can be may conclude as follows. There were significant differences in concept mastery of the students taught using the community of inquiry learning strategies from that of those treated with cooperative learning strategies in the elementary education of Muhammadiyah Bima. Additionally, there were significant differences in terms of concept mastery of the students' learning styles including dimensional visual, auditory, and kinesthetic after learning using the community of inquiry learning and cooperative learning in the elementary education of Muhammadiyah Bima. There was no interaction

between learning strategies and learning styles of the students' concept mastery. The results showed that there was a significant effect of the use of community of inquiry learning strategy on students' concept mastery. Besides, the students' learning styles also gave significant effect on students' concept mastery of in the elementary education of Muhammadiyah Bima. This study portrayed to the reader that the use of the community of inquiry learning is very suitable to be applied in elementary education, as it can increase students' activity and concept mastery, as well as accommodate all dimensions of students' learning styles of visual, auditory, and kinesthetic.

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