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Students' Critical Thinking Ability with Google Classroom-Assisted Project Based Learning and Inquiry Learning Models

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ABSTRACT

Covid-19 pandemic has a major impact on the world of education. Learning system that was previously carried out face to face was required to be carried online learning considering the social distancing rules. Project based learning and inquiry learning were used because they were appropriate for learning from home using google classroom and contributing to improve student's critical thingking ability. This study aims to determine 1) differences in students' critical thinking abilities with the application of the Project based learning model (PjBL), Inquiry and Conventional using Google Classroom media in Biology learning at SMA Negeri 4 Rejang Lebong, 2) a more effective learning model to improve reasoning and critical thinking skills. This research is a quasi experimental research. The population in this study were students of class X IPA SMA Negeri 4 Rejang Lebong. The research sample was determined by simple random sampling, in order to obtain class X IPA 1 and X IPA 2 as the experimental class and class X IPA 3 as the control class. The data collection method used an essay test with 5 items. Then the data were analyzed using one way ANOVA followed by the LSD test. The results showed that there were differences in students' critical thinking abilities in the application of the Project Based Learning (PjBL) model, inquiry learning and conventional learning assisted by Google Classroom. The PjBL and Inquiry models are better at improving students' critical thinking abilities compared to conventional learning. This research provides benefits for students to improve critical thinking ability.

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INTROUCTION

Critical thinking can be interpreted as a process and ability used to understand the concept, applying, synthesizing and evaluating the information obtained or information produced (Zubaidah, 2010). Knowing how and as far as a person's tendency in critical thinking is the first step to developing one's critical thinking (Syahfitri, et al., 2019). Jauhar (2011) states that competency standards for the

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field of science at high school level are emphasized in the ability to work scientifically, and the ability to understand the concepts of science and its application in life. The science learning approach should be more centered on students (Student Center). The development of this science learning is in accordance with the four pillars of education recommended by UNESCO, namely learning by doing (learning to do), learn to be (learning to know) and learn to live by working together (Learning to Live Together) (Juliani & Widodo, 2019).

The results of the literacy of Indonesian children can be used to assess the implementation of IPA in Indonesia. Science / Scientific Literacy Literacy (Scientific Literacy) is characterized by scientific work, and three large dimensions of science literacy set by Pisa (Program for International Student Assessment), namely IPA content, IPA processes and IPA context. The level of science literacy can be used as an indicator for the quality of education and human resources of a country. The World Level Science Literacy Study from Pisa (Program for International Student Assessment) in 2018, Indonesia ranks 72 of 78 countries (OECD, 2018). Data from this PISA shows the quality of Mastery of Indonesian students' science is still low. This indirectly also shows that students' critical thinking skills are also still low in no exception in biological subjects as part of science.

Based on the initial observation conducted on students of SMAN 4 Rejang Lebong in biological learning obtained facts as follows: First in student learning activities there are still many inactive, especially when answering questions from the teacher. In answering questions from the teacher, students tend to provide very short answers without giving wider and strong arguments. The second fact is from learning outcomes, the average value of students during the odd semester examination of the 2020/2021 school year is still low, which is 68.92. This value has not reached the KKM determined by the school which is 75. These facts show indirectly that critical thinking of students at SMAN 4 Rejang Lebong is still low.

In fact the biology learning activities carried out at SMAN 4 Rejang Lebong showed that learning activities were still centralized to the teacher. More teacher functions in knowledge transfer activities. This will certainly lead to less active learning activities for students who will affect low learning outcomes and indirectly reflect the critical thinking skills of students. Low learning outcomes can be caused by various factors, one of which is the lack of exactly the learning model used by teachers in the teaching and learning process (Aryana, 2009).

In 2020, Indonesia even the whole world experienced a pandemic Covid-19. Covid-19 pandemic has an impact on all life joints. The impact of the pandemic on the economy, social, security, and politics will affect psychological conditions and changes in the behavior that are wider in a longer period of time (ginting, 2020). This also applies in changing learning activities from learning activities in classes to learn from home. One form of alternative learning that can be carried out during the Covid-19 emergency period is online learning, one of which is by using Google Classroom. Afrianti (2018), states that Google Classroom is a mixed series of learning for educational scope that can facilitate teachers in making, distributing and classifying each paperless (paperless) assignment. Sari (2019) revealed that Google Classroom was effectively used in learning influenced by ease, benefit, and service quality.

The teacher as a facilitator of learning activities must strive for all means so that learning objectives can be achieved even in the pandemic period. One of them is by implementing project -based learning that is combined online (Arizona & Rumansyah, 2020). Both also explained that through project -based online learning, students can have meaningful learning so that their knowledge and knowledge can be a benefit as a provision to be a problem solving including achieving the ability to reason and critical thinking. Yuliana (2020) revealed that the project -based learning model is a learning model that can be used to apply the knowledge that is already owned, practicing a variety of

thinking skills, attitudes, and concrete skills so that it can improve students' critical thinking.

In addition to project -based learning, other creative learning activities in the pandemic period are inquiry learning (Giysi, 2020). According to Istikomayanti (2015) inquiry learning is a learning that reconstructs the meaning or relationships related to a learning process. Application of Project Based Learning Learning Activities and Inquiry Learning Using Google Classroom Media in this study is expected to improve students' critical thinking skills.

METHOD

Population and Sample

This research is a quasi-experimental research conducted at SMA Negeri 4 Rejang Lebong in the 2020/2021 academic year. The population of this study were all students of class X science which consisted of 5 classes, totaling 152 students. The sample selection used simple random sampling technique, so that class X IPA 1 was obtained as experimental class 1 with project based learning (PjBL), class X IPA 2 as experimental class 2 with inquiry learning and class X IPA 3 as control class with conventional learning. The three classes used Google Classroom.

Data analysis

The method of collecting data on critical thinking skills uses an essay test with 5 questions. Before testing the hypothesis, the analysis requirements test was carried out first, namely by conducting a normality test using the Kolmogorov-Smirnov test, and a homogeneity test using the Levene test. Hypothesis testing was then carried out using one way ANOVA, followed by the LSD test. Statistical calculations in this study used SPSS 20 software. The research design can be seen in the following table.

Table 1. Noneequivalent Pretest and Posttest Control Group Research Design

Group	Pretest	Treatment	Postest
E	Y_1	X_1	Y_2
E	Y_1	X_2	Y_2
K	Y_1	-	Y_2

(Sugiyono, 2015)

Notes :
E : Experimental Class
K : Control Class
X_1 : Project Based Learning learning treatment using Google Classroom
X_2 : Inquiry learning treatment using Google Classroom
Y_1 : Pretest
Y_2 : Posttest

RESULT AND DISCUSSION

The following data is obtained from the results of research carried out in the form of data on students' critical thinking abilities from the Project Based Learning (PjBL) in experimental, inquiry and conventional classes.

Description of Critical Thinking Ability Data

Critical Thinking Ability Pretest

The following is the data from the pretest of critical thinking skills for the experimental class 1, the experimental class 2 and the control class.

Table 2. Distribution of Critical Thinking Ability Pretest Results

Statistics	Class		
	Experiment		Control
	PjBL	Inquiry	Conventional
Total students	32	33	33
Average	40.937	41.212	40.303
Standard deviation	7.233	7.573	7.711
Variance	52.316	57.350	60.388
Highest score	56	53	53
Lowest score	28	23	26

Table 2 above shows that the average pretest score of the highest critical thinking ability is in the experimental class 2 or the inquiry class. Before carrying out the one-way ANOVA test, a prerequisite test will be carried out first, consisting of a normality test using the Kologorov-Smirnov method and a homogeneity test using the Levene method with the following results.

Table 3. Normality Pretest on Critical Thinking Ability

Ability Aspect	Class	Kolmogorov-smirnov			Conclusion	Desc.
		Statistic	Df	Sig		
Critical thinking	PjBL	0.131	32	0.176	Accept H_o	Normal
	Inquiry	0.100	33	0.200	Accept H_o	Normal
	Conventional	0.075	33	0.200	Accept H_o	Normal

Based on Table 3 above, it can be seen that the pretest value of critical thinking skills in the PjBL class has a significance value of 0.176. Inquiry class has a significance value of 0.200 and the conventional class has a significance value of 0.200. Based on these data, it is known that the three classes have a significance value of more than 0.05, so that at the 5% confidence level, the pretest scores for critical thinking skills in Project Based Learning (PjBL), inquiry and conventional classes are normally distributed. After performing the normality test, the next prerequisite test is the homogeneity test using the Levene test. The data from the homogeneity test can be seen in Table 4.

Table 4. Homogeneity Test of Critical Thinking Ability Pretest Variants

Levene Statistic	df1	df2	Sig.
0,199	2	95	0.820

Based on Table 4, it can be seen that the significant value obtained is 0.820, which means it is greater than 0.05, so it can be concluded that the critical thinking ability pretest data for Project Based Learning (PjBL), inquiry and conventional classes have homogeneous variances. After knowing that the critical thinking ability pretest data were normally distributed and homogeneous, and to see the difference in the average critical thinking ability pretest for all research classes, a one-way ANOVA test was carried out. The results of the Anova one-way critical thinking ability pretest can be seen in Table 5.

Table 5. ANOVA Test One Path Pretest on Critical Thinking Ability

Source of difference	Number of Squares	Df	Square Mean	F	Sig.	Conclusion	Description
Between groups	14.334	2	7.167	.127	.881	Accept H_0	
In the Group	5360.360	95	56.425				
Total	5374.694	97					

From Table 5 above, a significance value of 0.881 is obtained, which means it is greater than 0.05 (0.881 > 0.05). Thus, from the results of the pretest, it can be concluded that the level of students' critical thinking skills is not significantly different, so there is no need for further testing.

Critical Thinking Ability Posttest

The data from the measurement of critical thinking skills for experimental class 1, experiment 2 and control class can be seen in the following table.

Table 6. Distribution of Posttest Results of Students' Critical Thinking Ability

Statistics	Class		
	Experiment		Control
	PjBL	Inquiry	Conventional
Total students	32	33	33
Average	80.593	80.667	71.969
Standard deviation	6.932	6.886	8.865
Variance	48.052	47.416	78.588
Highest score	95	96	92
Lowest score	65	65	58

Table 6 above shows that the average posttest score of the highest critical thinking ability is in the experimental class 2, namely the inquiry class. Judging from the highest posttest average score, the conclusion while the most effective learning to improve critical thinking skills is through inquiry learning. This assumption will be proven by further hypothesis testing.

Before testing the hypothesis, a prerequisite test is carried out, namely the normality test and homogeneity test. The results of the posttest normality test of students' thinking abilities can be seen in Table 7.

Table 7. Normality Posttest of Critical Thinking Ability

Ability Aspect	Class	Kolmogorov-smirnov			Conclusion	Desc.
		Statistic	Df	Sig		
Critical thinking	PjBL	0.080	32	0.200	Accept H_o	Normal
	Inquiry	0.094	33	0.200	Accept H_o	Normal
	Conventional	0.105	33	0.200	Accept H_o	Normal

Based on Table 7, it can be seen that the posttest significance value of critical thinking skills from the three classes is more than 0.05. Therefore, it can be concluded that the critical thinking ability posttest data from the three classes have normal distribution. After performing the normality test, the next requirement analysis test is the homogeneity test using Levene's test. The

results of the posttest homogeneity test of critical thinking skills are as follows:

Table 8. Variants Homogeneity Posttest of Critical Thinking Ability

Levene Statistic	df1	df2	Sig.
1,562	2	95	0,215

Based on Table 8, it can be seen that the significant value obtained is 0.215, which means it is greater than 0.05, so it can be concluded that the posttest data on critical thinking skills in Project Based Learning (PjBL), inquiry and conventional classes have homogeneous variances. The results of the Anova one-way posttest for critical thinking skills can be seen in Table 9.

Table 9. One Path Anova Posttest on Critical Thinking Ability

Source of difference	Number of Squares	Df	Square Mean	F	Sig.	Conclusion
Between groups	1641.978	2	820,989	14.124	0.000	Reject H_0
In the Group	5522.022	95	58,127			
Total	7164.000	97				

In Table 9, the F value is 14,124 with a significance of 0.000 which means it is smaller than 0.05 (sig 0.000 < 0.05), so that it can be concluded that the posttest measurement results of students' critical thinking skills using the PjBL, Inquiry learning model and Conventional with the help of Google Classroom differ significantly.

Then, to find out the differences in critical thinking abilities of each PjBL, Inquiry and Conventional learning model in class X IPA SMA Negeri 4 Rejang Lebong, the LSD test was carried out. The results of the LSD posttest of students' critical thinking abilities can be seen in table 10.

Table 10. Post Hoc LSD (Least Significance Different) Test on Critical Thinking Ability

Class		Average difference	Std.error	Sig	H_0
PjBL	Inquiry	-0.0729	1.891	0.969	Accept
	Conventional	8.624*	1.891	0.000	Reject
Inquiry	PjBL	0.0729	1.891	0.969	Accept
	Conventional	8.696*	1.876	0.000	Reject
Conventional	PjBL	-8.624*	1.891	0.000	Reject
	Inquiry	-8.696*	1.876	0.000	Reject

Based on Table 10 above, it shows that the significance value obtained between Project Based Learning (PjBL) and Inquiry is 0.969 (sig 0.969 > 0.05) meaning that there is no significant difference between Project Based Learning (PjBL) and Inquiry. Between Project Based Learning (PjBL) and Conventional, the significance value obtained is 0.000 (sig 0.000 <0.05), meaning that there is a significant difference between Project Based Learning (PjBL) and Conventional. Between Inquiry and Conventional, the significance value obtained is 0.000 (sig 0.000 <0.05) meaning that there is a significant difference between the two.

Based on Table 10, it can also be seen that the average difference between the Project Based Learning class and the Inquiry class is 0.0729. This difference

number is quite small so that the significance result which states that there is no difference between the PjBL class and the inquiry class in this study is true. Table 19 also shows the difference between the PjBL class and the conventional class, which is 8,624. This means that the average posttest score of critical thinking skills in the PjBL class is 8.624 higher than the average posttest score of critical thinking skills in the experimental class. Meanwhile, the average difference between the conventional and the inquiry class is 8,696. It means, the posttest mean score of critical thinking ability in the inquiry class is 8.696 higher than the posttest mean score of critical thinking ability in the conventional class.

DISCUSSION

The implementation of Project Based Learning (PjBL) makes students more active in the learning process and independent in building knowledge. This is in line with Yuliana (2020) that Project Based Learning (PjBL) makes students develop because when students learn in their own way, they develop the ability to focus and reflect. Project Based Learning (PjBL) is also supported by constructivist learning theory. Constructivism is a widely supported learning theory that rests on the idea that students construct their own knowledge within the context of their own experiences. For complex problems, learning is needed through investigation, collaboration and experimentation in making a project, as well as integrating various subjects (materials) in learning. By applying the project-based learning model to train independence, collaboration and experimentation in students.

The implementation of project based learning model learning is carried out through several stages, namely discussions with friends with teacher guidance, preparation of learning scenarios according to PjBL learning steps, and carrying out project work according to each other's creativity. In the process of implementing project, each student does the work individually. The assessment technique carried out in each stage of PjBL is as follows: the teacher conducts an assessment using Google Cassroom because learning activities are carried out using Google Classroom.

Yensy (2020) explained that students can have discussions with teachers through sending project work results and asking questions related to the project. Problems that you want to ask can be submitted in Google Classroom. So that other students can try to solve or answer the problem before the teacher gives an answer. This is in accordance with the PjBL model described by DeFillippi (2001), namely that the monitoring step is the teacher's responsibility for the activities of students in implementing the project. Teachers can provide guidance at each stage of the project, then provide input and advice to students in the event of problems. The project based learning model can develop students' depth in understanding concepts that are greater than traditional classroom-based learning. This is also in line with what was conveyed by Adriani (2015), that Project based learning helps students in improving their reasoning abilities. In PjBL, students actively learn learning concepts more independently so that the knowledge gained is the result of students' own reasoning, of course with the help of the teacher who acts as a facilitator.

Learning in the second experimental class applies inquiry learning. As stated by Juhji (2016) that inquiry is a process of asking and seeking answers to these questions posed by teachers to students. According to Sanjaya (2016) inquiry learning is student-centered learning. Students play an active role in the learning process from finding information, seeking information, collecting information and solving the problem itself. Inquiry learning must be adapted to the material that will be given to students. In general, there are several steps in the inquiry process, namely 1) formulating problems, 2) proposing hypotheses, (3) collecting data and 4) drawing conclusions. According to Sutopo & Waldrip (2016) inquiry learning prepares

students to conduct experiments. In line with this, the posttest results of the reasoning abilities of students who studied with inquiry learning had a significant difference to the reasoning abilities of control class students.

The use of the Project Based Learning (PjBL) method in this study was carried out with the help of Google Classroom. This learning method encourages students to be active in the learning process. Students actively ask, answer, express ideas and ideas during the learning process and students have independence in completing the tasks they face. The application of this learning method provides an opportunity for teachers to manage classroom learning that involves project work, in this case the teacher is only a facilitator.Through project based learning, students are invited to collaborate, be independent and explore, the assessment used is also in accordance with the circular letter of the Minister of Education and Culture No. 4 of 2020, namely portfolio-based assessment by adjusting student conditions (access gaps). The learning process is carried out by prioritizing positive interaction and/or communication patterns between educators and students and parents. Project based learning makes students grow because when students learn in their own way, they develop the ability to focus and reflect. Working at their own pace also gives students the opportunity to take personal responsibility for the things they learn. This is an advantage of PjBL (Project Based Learning) which trains students to solve real-world problems, think creatively and innovatively through the creation of a given project.

All PjBL activities give positive results to students' critical thinking skills. This can be seen from the average posttest which increased compared to the pretest score. The results of this study are also in line with the results of the research of Apriani, et al. (2019) that the Project Based Learning (PjBL) learning model is better at improving critical thinking skills compared to the Problem Based Learning (PBL) and Conventional learning models. Research by Melda, et al. (2019) shows that Project Based Learning (PjBL) is better, so this learning model is recommended to be applied in schools.

In the second class, learning activities are carried out with inquiry learning. In the inquiry learning process, a work plan is needed to collect data that can be analyzed in order to draw conclusions. The guidance carried out in the learning process is able to improve communication skills so that students become more active in expressing opinions. Students' understanding of a learning material will affect their critical thinking skills and increase their responsibility for the things they learn.

The inquiry learning model requires students to share information with each other, thus influencing students' critical thinking skills through guidance in the learning process. Inquiry learning involves all scientific activities to obtain information such as hypothesizing, predicting, reading, planning and carrying out experiments. Students are required to be active in learning activities. The teacher only acts as a facilitator. This is in line with Irwandi's research (2020) that the inquiry approach is a teaching approach that seeks to lay the foundation and develop a scientific way of thinking.

Based on the results of data analysis and hypothesis testing, it was concluded that the critical thinking skills of students who studied with PjBL and Inquiry were better than students who studied conventionally. This is also in accordance with the opinion of Sanjaya (2016) which states that inquiry learning in science classes allows students to identify and critically review information.

Based on the data analysis, there is a significant difference between the inquiry class and the conventional class. The posttest average value of critical thinking skills in the inquiry class is higher than in the conventional class. In the inquiry class, learning activities involve all students' abilities to search and investigate systematically, critically, and logically-

analytically, so that students are able to formulate their own findings confidently. This is in line with the research of Sutama, et al. (2014) which concludes that there are differences in critical thinking skills between students who take inquiry learning and students who take direct learning. This is also in line with research conducted by Ramadan, et al. (2019) which states that inquiry learning has an effect on students' critical thinking skills.

Research conducted by Melda, et al. (2019) shows that inquiry is better, so this learning model is recommended for application in schools. The results of this study are also supported by Hidayat (2021), who suggests that there is an increase in critical thinking skills by applying a guided inquiry model in science learning, and there are factors that influence the success of the inquiry model on students' essential thinking skills, including mental readiness, students , effectiveness, and teaching skills in facilitating learning which will determine the success of guided inquiry.

CONCLUSION

Based on the results of data analysis and discussion, there are several conclusions, namely 1) there are differences in critical thinking ability of students with the application of the Project Based Learning (PJBL) learning model, inquiry and conventional using Google Classroom media in Biology Learning of SMA 4 Rejang Lebong, and 2) Project Based Learning (PJBL) and inquiry learning are more effective to improve students' critical thinking skills compared to conventional learning. Knowing the critical thinking ability of students becomes the basic capital to determine the learning model that will be applied in class. It is important to improve the ability of reasoning and critical thinking of students.

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