Improving students' critical thinking ability through the inquiry learning model and discovery learning

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Article Info

ABSTRACT

The issue underlying this research is the low critical thinking skills of students in SMAN 3 Ciamis which is caused by the learning process which still uses traditional, one-way methods and does not develop students' thinking skills. The purpose of this study was to determine students' critical thinking skills after applying Inquiry Leaning, Discovery Learning and Conventional methods. The method used is quasi-experimental with a Counterbalance research design. The instrument in the research was multiple choice complex questions that measured students' critical thinking skills. The results of analysis and testing using One Way Anova show that there are differences in students' critical thinking abilities from each treatment carried out in each class with different methods so that the hypothesis proposed can be accepted. Judging from the results of the acquisition of the average value (mean) of students' critical thinking skills in each study, it shows that classes using the Inquiry Leaning model are always higher than the Discovery Learning and conventional models. The conclusion of this study is that the Inquiry Learning model is more effective in improving critical thinking skills compared to Discovery Learning and conventional learning models.

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Introduction

Some students may lack familiarity with inquiry- or discovery-based learning approaches. Individuals may require a period of adjustment and understanding to participate and interact well with this educational process. Certain students may prefer a more organized and systematic approach to their educational experience and require further support and direction.The learning process which is generally carried out in schools can be used as a benchmark to determine the quality of education in a country. Teaching and learning activities include interaction activities between teachers and students. In this case, the role of the teacher is needed to create quality education. Education also has an important role in shaping an individual and is the key to all quality progress, becauprogresseducation, humans can realize all their potential. To realize this potential, it must go through an educational process that is implemented in the learning process, where learning is an important part of education(Lubis, 2019).Besides that, the development of the 21st century era requires students to have competencies including having the ability to think critically and problem-solving skills (critical-thinking and problem-solving skills), the ability to communicate and collaborate (communication and collaboration), the ability to create and renew (creativity and innovation). innovation skills), information and communication

technology literacy skills, contextual learning skills, and information and media literacy skills ((Cogan & Derricott, 2014), (Kauffman & Landrum, 2009), (Siregar & Nara, 2015)) .

Thinking is an activity that the brain always does to transfer information throughout the body. Starting from this thought process, humans can carry out physical and non-physical activities normally. This thinking ability is very necessary for humans to continue their survival, especially in this rapidly developing era.Facts in the field show that students' critical thinking skills are still far from what is expected. Based on pre-research conducted by researchers at SMAN 3 Ciamis, especially students in class XI, it shows that students' critical thinking skills in economics lessons are still relatively low. This fact was obtained based on the initial test results of critical thinking skills. As for more details, the following pre-research data are presented in table 1:

Table 1. Pre-Research Preliminary Test Result Data

Class	Number of students	KKM	Above KKM		Below KKM	
			Total	Percentage	Total	Percentage
XI A	32	75	6	18,75%	26	81,25%
XI B	32	75	8	25,00%	24	75,00%
XI C	32	75	10	31,25%	22	68,75%
Total	96	75	24	25%	72	75%

Note: KKM is Minimum Passing Criteria

Based on the table above, it is known that 75% of class XI students at SMAN 3 Ciamis still have scores below the KKM and 25% of students score above the KKM. This shows that students' critical thinking skills still tend to below. Problems related to students' critical thinking abilities result in students being hampered and difficult to deal with problems that require more complex thinking and problem solving. The formal education model that has been going on so far, if it continues to be maintained, will function to reduce students' higher-order thinking abilities because they prioritize aspects of memory only. This is one of the impacts if the learning process that has been going on until now continues to be implemented without any variation and creativity from a teacher to create and improve a more constructive learning process ((Ariyanti et al., 2013), (Ismail, 2020), (Muthoharoh, 2019)).

Learning methods can be interpreted as a way used to implement the plan that has been prepared in the form of real and practical activities to achieve learning objectives(Aditya, 2016). So ideally in the learning process in the classroom, the teacher must be able to vary the learning activities in terms of models, methods or learning media that are interesting and fun. So that students' abilities become more developed, especially in terms of thinking skills. One variation of the learning method or model that can be used is the Inquiry and Discovery Learning model. Inquiry and Discovery Learning models are learning models that facilitate students to develop their critical thinking skills. ((Priadi & Riyanda, 2021); (Sari & Lutfi, 2023)7). With this learning method students' criticality in learning can develop better because the teacher continues to develop the learning process by creating a fun learning atmosphere and designing how students are actively involved in the learning process so that students are able to discover the concepts of the material being studied with their own knowledge. By continuing to be stimulated using various learning models, it will improve students' abilities, one of which is Inquiry and Discovery Learning which stimulates students' cognitive abilities that can improve students' critical thinking skills ((Al Hakim et al., 2018); (Priarana et al., 2014); (Martaida et al., 2018)).

Based on this background, the researchers are interested in conducting research entitled "Improving Students' Critical Thinking Skills Through Inquiry and Discovery Learning Models (a Quasi Experiment on Students of Economics Class XI SMN 3 Ciamis)". Therefore, the purpose of this study is to determine the critical thinking skills of students after applying the Inquiry Leaning, Discovery Learning and Conventional methods.

Method

In this study, the Quasi-Experimental Design (pseudo-experimental) was used by using a Counterbalanced Design. The design in this study is in the following chart:

Table 2. Counterbalanced Research Design

XI A	X_1	O_1	X_3	O_2	X_2	O_3
XI B	X_2	O_1	X_1	O_2	X_3	O_3
XI B	X_3	O_1	X_2	O_2	X_1	O_3

Information:

X_1　　　　　　　= The use ofInquiry learning model
X_2　　　　　　　= The use ofDiscovery Learning model
X_3　　　　　　　= The use of Conventional learning model
$O_{1,2,3}$　　　　　= posttest

Research Subjects

In this study, the research subjects consisted of class XI students at SMAN 3 Ciamis for the 2020-2021 even semester academic year, namely classes XI A, XI B and XI C. Then these classes were used as research classes which later in each class would be given treatment, namely the Inquiry learning model, Discovery Learning and Conventional. For more details, the research subjects are presented in table form as follows:

Table 3. Research Subjects

Class	Total of Students	Information		
		Cycle I	Cycle II	Cycle III
XI A	32	*Inquiry*	*Conventional*	*Discovery Learning*
XI B	32	*Discovery Learning*	*Inquiry*	*Conventional*
XI C	32	*Conventional*	*Discovery Learning*	*Inquiry*

Variables Operationalization

The variables in this study are as follows: 1) Independent Variable. The independent variable is the variable that influences or causes the change or the emergence of the dependent variable. In this study, the independent variables included were Inquiry, Discovery Learning and conventional methods; 2) Dependent Variable. In this study, the dependent variable is Critical Thinking Ability.

From the explanation and statement above, the variables can be described more clearly with the variable operationalization table as below:

Table 4. Research Variables Operationalization

Variable	Dimension	Indicators	Instrument
Critical Thinking Ability (Y) Critical thinking is "a process that emphasizes logical and rational beliefs, and provides a set of standards and procedures for analysis, test, and evaluate." Ennis (Kokom, 2010:266)	1) Give a simple explanation 2) Build basic skills 3) Make inferencing 4) Make further explanations 5) Setting strategy and tactics	a) Focusing the question. b) Analyzing arguments c) Asking and answering questions d) Consider the reliability of sources e) Observation and consider the reports f) Deduce and consider the results of the discussion g) Induce and consider the results of the discussion. h) Defining terms and considering a definition i) Identify assumption j) Decide actions k) Interact with others	Complex Multiple Choice Test

Results and Discussions

Pretest Results of Students' Critical Thinking Ability

Calculation of the average value is the first step for further testing. The following is the result of calculating the average value contained in the table below:

Table 5. Average Critical Thinking Ability Pretest Score

No	Model	Study I		Study II		Study III	
		Mean	Class	Mean	Class	Mean	Class
1.	Inquiry Learning	45,9	XI A	46,7	XI B	48,8	XI C
2.	Discovery Learning	50,2	XI B	48,1	XI C	49,1	XI A
3.	Conventional	48,1	XI C	48,1	XI A	50,3	XI B

Based on the above data, it is known that the pretest average score of students' thinking ability in each cycle shows the value of critical thinking ability which is not much different. This means that students' initial abilities in terms of critical thinking have abilities that are not much different both in classes that use Inquiry, Discovery Learning models and those that use conventional methods.

Posttest Results of Students' Critical Thinking Ability
The following is the result of calculating the average final ability (Posttest) of students' critical thinking:

Table 6. Average Critical Thinking Ability Posttest Score

No	Model	Study I		Study II		Study III	
		Mean	Class	Mean	Mean	Class	Mean
1.	Inquiry Learning	83.4	XI A	83.4	XI B	83.8	XI C
2.	Discovery Learning	76.6	XI B	81.6	XI C	81.6	XI A
3.	Conventional	69.1	XI C	70.0	XI A	73.8	XI B

Based on the data above, it is known that the posttest average value of students' thinking skills in cycle I shows that the average value of critical abilities in classes using inquiry is higher than the average value of students' critical thinking abilities in classes using Discovery Learning and conventional models. ; Likewise in cycle II and cycle III. This means that the class that uses the Inquiry learning model produces an average value of critical thinking skills that is higher than the class that uses the Discovery Learning model and conventional.

Result of Increase (gain) in students' Critical Thinking ability
The following is the result of calculating the average value of the increase (gain) in students' critical thinking skills:

Table 7. Average Increase (Gain) In Critical Thinking Skills

No	Model	Study I		Study II		Study III	
		Mean	Class	Mean	Mean	Class	Mean
1.	Inquiry Learning	37.5	XI A	36,7	XI B	35	XI C
2.	Discovery Learning	26,4	XI B	33.4	XI C	31.9	XI A
3.	Conventional	20,9	XI C	21.9	XI A	23.4	XI B

Based on the data above, it is known that the average value of the increase (gain) in students' thinking abilities in cycle I shows that the average value of the increase (gain) in critical thinking abilities in classes that use inquiry is higher than the average increase (gain) in the value of critical thinking skillsof students in classes that use Discovery Learning and conventional models; Likewise in cycle II and cycle III. This means that classes that use the Inquiry learning model produce an average value of increasing (gain) critical thinking skills that are higher compared to classes that use Discovery Learning and conventional models.

Hypothesis Testing
Hypothesis testing uses statistical test ANOVA (One Way Anova). The results of calculations and tests using One Way Anova in each cycle are as follows:

Cycle I :
Based on the results of tests that have been carried out in cycle I using One Way Anova, it can be concluded that: 1) Inquiry class XI A Gain – Discovery Learning XI B class gain shows a Sig value of 0.004 <0.050, thus it can be concluded that H0 is rejected and H1 is accepted, meaning that the increase in critical thinking skills of class XI A students who use the Inquiry model has a significant difference with the increase in critical thinking skills class XI B students who use the Discovery Learning model; 2) Inquiry class XI A gain – Conventional class XI C gain shows a Sig value of 0.006 <0.050 thus H1 is accepted and H0 is rejected meaning that the increase in critical thinking skills of class XI A students who use the Inquiry model has a significant difference with the increase in critical thinking skills of class XI students C which uses the Conventional method; 3) Discovery Learning XI B class gain - Conventional class XI C gain shows a Sig value of 0.001 <0.050 thus H0 is rejected and H1 is accepted meaning that the increase in critical thinking skills of class XI B students who use the Discovery Learning model has a significant difference with the increase in students' critical thinking skills class XI C that uses conventional methods.

Cycle II :
Based on the results of tests that have been carried out in cycle II using One Way Anova, it can be concluded that: 1) Inquiry XI B class gain – Discovery Learning XI C class gain shows a Sig value of 0.002 <0.050 thus H0 is rejected and H1 is accepted meaning that the improvement in the critical thinking skills of class XI B students using the Inquiry model has a significant difference with the increase in the critical thinking skills of

class XI C students using the Discovery Learning model; 2) Inquiry class XI B gain – Conventional class XI A gain shows a Sig value of 0.006 <0.050 thus H1 is accepted and H0 is rejected meaning that the increase in the critical thinking skills of class XI B students using the Inquiry model has a significant difference with the increase in the critical thinking skills of class XI A students using conventional method; 3) Discovery Learning class gain XI C - Conventional class XI A gain shows a value of Sig = 0.048 <0.050 thus H1 is accepted and H0 is rejected meaning that the increase in critical thinking skills of class XI C students using the Discovery Learning model has a significant difference with the increase in students' critical thinking skills class XI A using conventional methods.

Cycle III :
Based on the results of tests that have been carried out in cycle III using One Way Anova, it can be concluded that: 1) Inquiry XI C class gain - Discovery Learning XI A class gain shows a Sig value of 0.004 <0.050 thus H0 is rejected and H1 is accepted meaning that the increase in the critical thinking skills of class XI C students who use the Inquiry model has a significant difference with the increase in the critical thinking skills of class XI students A which uses the Discovery Learning model; 2) Inquiry class XI C gain - Conventional class XI B gain shows a Sig value of 0.041 <0.050 thus H1 is accepted and H0 is rejected meaning that the increase in the critical thinking skills of class XI C students using the Inquiry model has a significant difference with the increase in the critical thinking skills of class XI B students using conventional methods; 3) Discovery Learning class gain XI A – Conventional class XI B gain shows a value of Sig = 0.006 <0.050 thus H0 is rejected and H1 is accepted meaning that the increase in critical thinking skills of class XI A students who use the Discovery Learning model has a significant difference with an increase in critical thinking skills class XI B students who use conventional methods.

The effectiveness of using the Inquiry model compared to the Discovery learning model
Based on the results of the testing and analysis that has been carried out, it shows that there is a significant difference in improvement between the critical thinking skills of students who use the Inquiry learning model and students who use the Discovery Learning model, where the value of class improvement using the Inquiry learning model is superior to classes using Discovery Learning model.

The research results are in line with the study conducted by ((Ismail, 2020); (Pratiwi & Mawardi, 2020); (Malinda, 2019))who argued that the level of critical thinking skills in learning using the inquiry model is higher than discovery learning. This means that there are significant differences in the inquiry learning model and discovery learning on critical thinking skills.

In addition, research conducted by((Batubara, 2014); (Danial et al., 2017)) who argued that learning using inquiry improves critical thinking skills more than using discovery learning. The results of the research show that the Inquiry learning model is superior to the discovery learning model. In addition, the use of the Inquiry method contributes to increasing students' critical thinking skills which are higher than the Discovery Learning model. Based on the results of the analysis in this study and other relevant research above, it indicates that the Inquiry Learning and Discovery Learning methods can be applied and realized effectively and innovatively by educators so that they are better able to improve students' critical thinking skills.

The effectiveness of using the Inquiry model compared to conventional methods
Based on the results of the testing and analysis that has been done, it shows that there is a significant difference between the critical thinking skills of students who use the Inquiry learning model and students who use conventional methods, where the value of class improvement using the Inquiry learning model is superior to classes using conventional methods.

The research results are in line with a study conducted by ((Priarana et al., 2014); (Rohmah, 2015);(Ghaemi & Mirsaeed, 2017); (Usdalifat, 2016)) who argued that there were significant differences between classes using the Inquiry learning model with conventional methods. In addition, a study conducted by (Kawuwung, 2019) reported the results of the study that there were significant differences in the improvement of students' critical thinking skills in classes that applied inquiry learning to conventional learning.

The research results are also in line with the 2014 Ministry of Education and Culture which states that inquiry-based learning is learning through various activities including making observations, asking questions, seeking and using information to clearly know events through experiments, using tools to collect, analyze and interpret data; make statements, explain and predict; and communicate results. Inquiry requires identification and assumptions, using critical and logical thinking and consideration of alternative explanations.

Inquiry is an innovative learning model that can develop students' ability to understand and acquire knowledge through systematic and scientific thinking. Inquiry prioritizes student activity in the process of

learning activities where students are in the process of learning activities where students build knowledge and understanding of how a scientist works. The highest increase in students' critical thinking skills is found in the explanation indicator (explanation), this is because in learning with this inquiry model students are required to do explanations so that indirectly students' explaining skills can develop. Some students were able to explain the suitability between the predictions that had been made and the results of the observations that had been made.

Other research is in accordance with the research conducted by (Falahudin et al., 2016)from the results of the study showing that inquiry learning has more influence on students' critical thinking abilities. In the research conducted, the class that uses the Inquiry learning method suppresses active work and students' critical thinking processes. Students are invited to think about identifying problems, express problem-solving ideas, design their own experiments to answer the problems they face, conduct experiments to find answers, analyze and interpret data, find answers, and discuss the results until conclusions are drawn. While learning that is applied to conventional method classes the teacher's role is more dominant than student activities so that it tends to make students passive in the learning process. Learning in conventional method classes the role of the teacher is more dominant in student activities so that students tend to be passive in learning and the process of absorbing information is less effective. The teacher explains the concept of product packaging design. When the teacher delivered the material, students did not respond to the questions posed by the teacher. Conventional learning does not facilitate students to develop critical thinking skills.

Based on the results of the analysis in this study and other relevant research above, it indicates that the Inquiry learning model can be applied and realized effectively and innovatively by educators so that they are better able to improve students' critical thinking skills.

The effectiveness of using the Discovery Learning model compared to conventional methods
Based on the results of the testing and analysis that has been carried out, it shows that there is a significant difference between the critical thinking skills of students who use the Discovery Learning model and students who use conventional methods. where the value of class improvement using the Discovery Learning model is superior to classes using conventional methods.

The results of the research are in line with a study conducted by (Nahdi & Apriadi, 2015) which suggests that the increase in the creative thinking abilities of students who obtain the discovery learning model is significantly better than students who receive conventional learning. And research conducted by (Nurrohmi et al., 2017) which states that the increase in critical thinking skills of students who are treated with the discovery learning model is higher than students who receive conventional learning.

Discovery is a mental process when students assimilate a concept or a principle. These mental processes include observing, explaining, classifying, making conclusions, and so on. Students are prepared to plan their own learning research to formulate learning conclusions (Hendracipta, 2016). The discovery learning model is defined as a teaching procedure that emphasizes teaching someone, manipulating objects before arriving at generalizations. With this technique students are left to discover for themselves or experience their own mental processes, the teacher only guides and gives instructions. So that learning involves students in the process of mental activity through exchange of opinions, by discussing, reading for themselves and trying it for themselves, so that students can learn on their own. This shows that the discovery learning method can make students more critical, creative in learning, students get new experiences in learning. Besides that, the discovery learning model also makes students more active in learning and searching for material so that learning will be more meaningful compared to conventional methods, students are less active, because learning is centered on the teacher not on students. then students only get the knowledge given by the teacher. Students are not given freedom during learning.

Based on the results of the analysis in this study and other relevant research above, it indicates that the discovery learning model can be applied and realized effectively and innovatively by educators so that they are better able to improve students' critical thinking skills.

Conclusions

Based on the results of the research conducted, it can be concluded there are differences in the increase in students' critical thinking in classes that use the Inquiry learning model with classes that use the Discovery Learning model. Critical thinking of students using the Inquiry Learning method is higher than students using the Discovery Learning model, there are differences in the increase in students' critical thinking in classes that use the Inquiry learning model with classes that use conventional methods. Critical thinking of students using the Inquiry learning model is higher than students using conventional methods, and there are differences in the

increase in students' critical thinking in classes that use the Discovery Learning model with classes that use conventional methods. Critical thinking of students using the Discovery Learning model is higher than students using conventional methods.

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