Improving Critical Thinking Ability Through Discovery Learning Model Based on Patiayam Site Ethnoscience

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Abstract. This study aims to determine the improvement of critical thinking ability toward grade IV elementary school student using Discovery Learning model based on Patiayam site ethnoscience. This research type is Quasy Experimental Design with the form of non-equivalent control group design. The sampling technique used is the type of Cluster Randong Sampling. The result of n-gain analysis show that the control class gets average 0.2535 as low category, while the experiment class gets average 0.5574 as medium category. The result of Independent Sample t-test show result of critical thinking ability on the observing with the result of Sig. (2-tailed) of 0.000 < 0.05. The conclusions of this study are the result of the critical thinking ability of the experimental group are higher than result of the control group.

1. Introduction
In the face of competition in the era of Industrial Revolution 4.0, the Indonesian government is in the midst of various policies. It is no exception in the world of education. The Minister of Education and Culture (Minister of Education) has prepared a special learning strategy to deal with The Industrial Revolution 4.0. The strategy was designed by redesigning the education curriculum oriented toward 21st century proficiency, namely Critical Thinking Creativity, Communication, and Collaboration.

Instilling critical thinking skills in teaching and learning activities is part of value education. When it comes to the future, schools as educational lenbaga are not only responsible for transferring science and technology. However, it also cultivates character, personality and proficiency in dealing with various life problems. To achieve this, teachers need to improve skills that can guide students to improve critical thinking skills. Teachers need to facilitate the development of the students' critical thinking skills by providing relevant activities, which can be embedded within any subject, with some creativity from the teachers [1]. So that teachers need to
change the learning model used with a learning model that is able to make students more active and feel trusted to analyze independently. One of the learning models suggested by the 2013 curriculum is the discovery learning model.

Hanafi explained that discovery learning is the method that takes place when a teacher sets up an experiment, acts as a coach, and provides clues along the way to help students come to solutions. In this way, teachers provide students with certain tools for learning a concept, and the students make sense of the tools [2]. Discovery learning is a series of learning activities that are expected to empower the students to become independent individuals who are able to develop their cognitive abilities and improve their ability to communicate and social skills [3]. Discovery learning is the method that when the teacher does not give the final material and students must organize their own material with stimulus given by the teacher [4]. Discovery learning leads students to understand concepts, meanings, and relationships, through intuitive processes to finally come to a conclusion. The stages of this learning model are stimulation, problem statement, data collection, data processing, verification, and generalization [5].

Discovery learning is believed to improve students’ learning outcomes and activities in schools compared to conventional methods. The application of discovery learning models in learning can be used as a means of guiding students to find their own concepts and information so that students more easily understand the material due to the meaningful learning process. Discovery learning models are proven to improve students’ learning outcomes, learning activities are improved, including the activeness of students in expressing opinions, cooperation with others and confidence [6]. Morelent also explained that discovery learning can improve students’ learning motivation [7].

Discovery learning can be applied by integrating cultural wealth in the surrounding environment. The government strongly supports cultural preservation efforts by incorporating local culture-based learning programs as defined in government regulation number 19 of 2005 on national standards of education article 14 paragraph (1) and refined in the 2013 curriculum that supports learning to utilize culture which is that the curriculum must be responsive to the development of science, culture, technology and the arts that can build curiosity and the ability of students to utilize appropriately. Therefore, it is important for schools to teach learning based on local wisdom culture. Learning that elevates elements of local culture and wisdom is expected to improve the critical thinking skills of students to meet the era of industrial revolution 4.0. Organized learning in a system of knowledge from local cultures and arts, related to certain natural phenomena and events is called Ethnosains. Ethnosains comes from the word "Ethnos" meaning nation and "scientia", which indicates knowledge, ethnosience functions will make it easier for students to explore facts and phenomena that exist in society and become integrated with scientific knowledge [8]. States that the implementation of ethnoxylist IPAberbasis learning is to integrate the material with the environment, culture, and social that exists in the surrounding environment [9].
In Jekulo sub-district there are several local cultures that can be associated with learning materials. One of them is a Patiayam Archaeological Site. This site is precisely located in Terban village Jekulo sub-district of Kudus Regency. The number of fossils found in the Patiayam area is of particular appeal to tourists. Patiayam Museum officials say that up to now as many as 7,000 fossils have been collected. The find consists of 16 species of ancient animals, such as bulls, elephants, antelope, and ancient marine animals. This collection does not include new fossils found on the Patiayam site, as no identification has yet been made (SuaraMerdeka.com.2019). This site has several potentials including historical, geological, natural tourism and cultural potential. Patiayam site has been designated as one of the Cultural Reserves in Kudus Regency.

From this explanation, patiayam site-based discovery learning model that does not separate between science, culture and local wisdom can be used as a teacher learning approach, especially on the science learning content of natural resource materials. The implementation of the learning model aims to improve 21st century proficiency, especially critical thinking skills. In addition, students are also expected to be able to hone their creative thinking skills, collaborate, and communicate because they are guided to find concepts independently through the scientific process.

2. Methods
The population in this study was the IV grade students of Elementary School in Jekulo District, Kudus Regency. The sampling technique in this study was carried out by cluster random sampling obtained by the 4 Bulungcangkring Elementary School students as the control class and 5 Bulungcangkring Elementary School as the experimental class. The sample in this study was two classes, one class as an experimental class consisting of 26 students and one class as a control class consisting of 42 students. Data collection of critical thinking ability using observation sheets. The analysis test is instrument analysis and data analysis. Instrument analysis includes validity tests. The data analysis method consists of initial and final data analysis. Initial data analysis includes normality tests and homogeneity tests. Final data analysis includes gains score and t-tests.

3. Result and Discussion
Discovery learning model based on ethnoains Patiayam site is a learning model in which there are sintak that have been integrated with ethnosains in the Patiayam Site environment. In its implementation students are guided to find material concepts by performing step by step sintak discovery learning based on ethnoains Patiayam site. Starting from stimulations stage, problem statement, team organization, data collection, data processing, verification, generalization, to product development. The material presented is integrated with the culture of the people around Patiayam Site. The implementation of learning can be seen in picture 1 and 2 below:
The culture of society inserted in the learning process can have a positive effect on the learning process. Kurniawan, et al mentioned that indigenous science teaches a learning related to the environment when associated with scientific knowledge[10]. Ethnosains can also be used as a means to guide students innaling a problem. As Parmin & Fidia has stated, they state that the knowledge gained from the analysis of indigenous knowledge can improve students' skills in solving a problem [11]. In this case the Patiayam Site located in Jekulo Sub-District has a culture that can be attributed to scientific knowledge.

Students' ability to solve problems is part of a critical aspect of thinking that needs to be honed and developed. To recognize critical thinking skills in students needs to be analyzed by applying the right learning model. Tosuncuoglu stated that students who think critically are students who are able to investigate, analyze, receive or deny data, evaluate and draw conclusions [12]. Aspects of critical thinking skills can be seen through the implementation of sintak discovery learning model. Sulistiani argues that discovery learning has several strengths, one of which can make students more active in learning because students have to associate new knowledge with the knowledge they embrace to discover new concepts [13].

The result in this study is an improvement in critical thinking ability using discovery learning models based on ethnosains patiayam sites in grade IV elementary school students. The Process of Improving learning in experiment classes and control classes was tested using the score gain listed in Table 1 below.

Table 1. Result Of The Test Gain Score

| Group            | Average (%) | n-gain | Information |
|------------------|-------------|--------|-------------|
|                  | Early       | Final  |             |
|                  | Learning    | Learning |          |
| Experiment Class | 56.37       | 79.21  | 0.5574      | Are         |
| Control Class    | 55.88       | 67.04  | 0.2535      | Low         |
The results of the n-gain analysis in Table 1 show that the experiment class scored an average of 0.5574 with a moderate category, the control class getting an average score of 0.2535 with a low category. The results of the Independent Sample Test of critical thinking capabilities are listed in Table 2 below.

| t-test for Equality of Means | t-test for Equality of Means |
|-----------------------------|-----------------------------|
| Levene's Test for Equality of Variances | Levene's Test for Equality of Variances |
| F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| NGain | Equal variances assumed | .001 | .979 | 5.692 | 66 | .000 | .30386 | .04610 | .21183 | .39589 |
| | Equal variances not assumed | 6.519 | 51.231 | .000 | .30386 | .04661 | .21030 | .39742 |

The results of the Independent Samples Test in Table 2 above show a difference in the average results of critical thinking abilities with Sig results. (2-tailed) 0.000 < 0.05. This suggests that there is an average difference in critical thinking ability learning outcomes between the experiment group and the control group. The use of discovery learning model based on patiayam site ethnoscience in the experiment class showed a difference in critical thinking ability with the control class. The results obtained show significant results.

Based on the results of the n-gain data analysis, the critical thinking skills of the experimental class students scored an average of 56.37 in early learning and 79.21 in final learning, an increase of 0.5574 in the moderate category. Control classes scored an average of 55.88 in early learning and 67.04 in final learning with an improved score of 0.2535 in the low category. Thus patiayam site-based discovery learning models are effectively used to improve students' critical thinking abilities.

This is in line with the opinion expressed by Nurcahyo, et al, that the discovery learning with scientific approach encourages students to solve problems actively and able to improve students' critical thinking skills with scientific approach so students can build scientific thinking including observing, asking, reasoning, trying, and networking [14]. Rudibyani points out that the discovery learning model is effective in improving students' critical thinking skills on Arrhenius acid-base material. This is demonstrated by significant differences between n-Gain values in the control and experimental classes, where the control class has a more n-Gain big [15]. The same opinion expressed by Martaida, et al, that The critical thinking abilities of students who are taught with discovery learning are better than students who are taught by conventional learning [16].

In addition, there are several relevant similar studies on the use of Discovery Learning models, critical thinking skills, and ethnoscience learning conducted by Karim, showing that the results of research understanding critical concepts and thinking abilities of students who follow math learning with better guided methods of
discovery than students who follow conventional learning are reviewed at school level, most students show a positive attitude towards math learning with guided method of discovery[17]. Damayanti et al shows that ethnosains integrated natural science learning model developed is valid and feasible. The effectiveness of the application of learning models is seen from the number of students who achieve completed grades of more than 70%. The two-sample T-test test showed the experiment class had a better average of learning outcomes than the control class. Based on the N gain analysis, the percentage of students in the experiment class who gained the “high” category was more than the percentage of students in the control class [18]. Ahmatika in her research concluded that there was an increase in students' critical thinking skills using the inquiry/discovery approach [19]. Similar research has also been conducted by wartono, which states that discovery learning through empirical and theoretical reviews results in higher critical thinking skills than conventional learning [20].

This research has several main obstacles in terms of time. The learning time of only 35 minutes per meeting has not been able to give students the flexibility to perform the learning sintak optimally.

4. Conclusion

Based on the results of the study after analysis and discussion according to the relevant theory, it can be concluded that the results of the critical thinking skills of the experiment group students using the Discovery Learning model based on Estosains Patiayam site are higher than the results of critical thinking ability of the control group. This is evident from the increase in the average score of critical thinking skills of students in the experiment class, which is 0.5574 with moderate category. Higher than the control group that only scored 0.2535 with a low category. The t test result was obtained a value of thiung = 6.592 with a significance level of 0.00 < α = 0.05

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