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## The Effect Problem Based Learning Model and Group Investigation Model to Critical Thinking Skill of Student on Biodiversity

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### ABSTRACT

This research was conducted in class X field that aims to determine: the effect influence model (Problem Based Learning, Group Investigation, and Conventional) towards critical thinking skill of students on material biodiversity (flora). The population in this study are 4 classes, and samples used in this study consisted of three classes, model class X<sub>2</sub> serve as an experimental class taught by Problem Based Learning, class X<sub>3</sub> be used as an experimental class taught by the model Group Investigation, and class X<sub>1</sub> used as a control class is taught by conventional model. Data collection instruments using: test the critical thinking skill in the form of multiple choice is 25 questions. This research method quasi experiment with data analysis techniques using Anacova with significance level  $\alpha = 0.05$  and followed by Scheff's test with SPSS 22.0. The result showed that: there is the effect of the learning model (Problem Based Learning, Group Investigation and Conventional) against the student's critical thinking skills. Critical thinking skills of students that learned with Problem Based Learning model of  $81.60 \pm 7.72$  higher and significantly different than Group Investigation model  $74.56 \pm 8.92$  and Conventional  $61.47 \pm 11.26$ .

**Keywords:** Critical Thinking Skills, Group Investigation, Problem Based Learning

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### INTRODUCTION

So far the process of learning in schools is still dominated by a paradigm that states a knowledge (knowledge) is a device of facts that must be memorized. The learning process still supports the teacher, so the students become less active in the biology learning process. In addition, biological learning is still resolved in the cognitive learning of students who are still low (Kunandar, 2007). If observed carefully then the problems found in the field can be categorized into two factors that are derived from within (internal) students themselves and factors that come from outside (external) students. Suparno (2001) suggests that one of the factors within students is that they find it difficult to digest biology lessons because the material is considered difficult. They consider biology lessons to be a lot of memorizing lessons (Huda, 2002).

Based on observations that have been made, the low biology learning outcomes, especially Biodiversity materials can be caused by less attractive learning model so that students first feel bored before studying the material given by biology teachers. Biology teachers still dominate teaching and learning activities in the classroom and become the only source of information so that learning activities only prioritize cognitive aspects without regard to affective and psychomotor aspects. In biology teaching and learning activities on Biodiversity materials, biology teachers still use lecture and discussion methods.



In addition, learning activities in the classroom do not hone students' critical thinking skills. It is characterized by the lack of questioning, answering, responding and expressing opinions, not being accustomed to learning by beginning issues and finding out for themselves what they learn, so that students' critical thinking skills can not be fully utilized. Muhfahroyin (2009) critical thinking is a process involving mental operations such as induction, deduction, classification, and reasoning. The key to critical thinking is to develop an impersonal approach that takes account of arguments and facts in line with personal views, opinions and feelings. Ennis in Costa (1985) mentions five critical aspects of thinking: a) giving basic explanations (clarification), b) building basic skills, c) concluding, d) explaining further, and e) managing strategies and tactics.

Hassoubah (2007), mentions that critical thinking skills are skills to: 1) determine the credibility of a source; 2) distinguish between the relevant from the irrelevant; 3) distinguish fact from assessment; 4) identify and evaluate unspoken assumptions; 5) identify existing biases; 6) identify the point of view; and 7) evaluate the evidence offered to support the recognition. Based on the above, critical thinking is a high-level thinking skill that potentially increases students' critical analytical power. Improvement of students' critical analytical power is closely related to improving students' intellectual ability. Therefore, developing the critical thinking skills of students in learning is an effort to improve student learning outcomes.

In order for the learning process to run optimally and the results of learning is satisfactory, need to plan the selection of the right model of learning. One of the alternative learning that can improve student's critical thinking skills in biology learning especially Biodiversity materials is learning which gives space to students to be able to find and build their own concept and can develop student's critical thinking skills. The learning model that can be applied is Problem Based Learning (PBL) and Group Investigation (GI) which is very applicable to Biodiversity material which is a material that requires a lot of investigation and many problems to be solved related to the daily life of the students.

Ratnaningsih (2003), Problem Based Learning (PBL) is one of the learning model that requires students' mental activity to understand a learning concept through situations and problems presented at the beginning of the learning with the aim to train students to solve problems. Arends (2004), the PBL model is a learning model that guides learners to work on authentic issues with the intent to develop their own knowledge, develop inquiry and high-level thinking skills, develop self-reliance and confidence. Barrows (1996) in his work entitled "*Problem-Based Learning in Medicine and Beyond: A Brief Overview*" suggests some of the characteristics of Problem-Based Learning as follows. 1) the learning process is student-centered, 2) the learning process takes place in small groups, 3) the teacher acts as a facilitator or mentor 4) the problems presented are learning stimulus 5) new information is obtained from self-directed learning, and 6) the problem is a vehicle for developing problem solving skills. Meanwhile, Ehlert (2004) states that the advantages of the PBL model are: (1) providing opportunities for learners to conduct research; (2) building critical thinking skills;



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(3) recognize the subject matter content and build the objectives according to the concept; (4) empowering learners to become experts in a particular field; (5) allows learners to produce more than one form of solution; (6) expressing uncertainty and need to develop assumptions; and (7) motivate learners.

Like the PBL, the Group Investigation (GI) is a learning model that fits the constructivist paradigm. The GI model provides the widest opportunity for students to be directly involved and active in the learning process from planning to how to study a topic (Suati, 2010). Through the GI model learners interact with much information while working collaboratively with others in cooperative situations to investigate problems, plan and make presentations, and evaluate the results of their work (Tsoi, 2004). This model also requires students to have good communication skills and group process skills. Through the GI model the learning atmosphere will be more effective, the group collaboration in learning will inspire the students to have courage in bringing opinions and sharing information with other friends in discussing learning materials (Mashita, 2012).

The learning setting with the PBL and GI model is implemented in small groups so that during the learning process it provides opportunities for students to deal with the complexity of the opinions of their group of friends. This situation accustoms students to quickly and precisely in making decisions. This implies that students as learners must actively construct the learned knowledge so that the learned concept is embedded in its cognitive structure and is able to link between one concept and another. Thus, it is clear that PBM and IK models provide opportunities for students to strengthen their understanding of concepts (Akca, 2009).

The advantages of IK model in improving learning outcomes are to help students understand difficult concepts. The advantage of this group is that students are better able to express the logical reasons for their choice of answers when evaluated. This shows that learners should have the curiosity to understand the material with a lot of thinking so that learners can do peer tutors. Cooperative learning strategies can increase motivation and improve academic achievement (Sanjaya, 2008).

The learning setting with the PBL and GI model is implemented in small groups so that during the learning process it provides opportunities for students to deal with the complexity of the opinions of their group of friends. This situation accustoms students to quickly and precisely in making decisions. This implies that students as learners must actively construct the learned knowledge so that the learned concept is embedded in its cognitive structure and is able to link between one concept and another. Thus, it is clear that PBL and GI models provide opportunities for students to strengthen their understanding of concepts (Akca, 2009).

The advantages of GI model in improving learning outcomes are to help students understand difficult concepts. The advantage of this group is that students are better able to express the logical reasons for their choice of answers when evaluated. This shows that



learners should have the curiosity to understand the material with a lot of thinking so that learners can do peer tutors. Cooperative learning strategies can increase motivation and improve academic achievement (Sanjaya, 2008).

## MATERIAL AND METHODS

This research was carried out in college foundations Budisatrya Medan, which is located at street Letda Sujono Number 166, Bandar Selamat, Medan Tembung, Medan 20223, North Sumatra. The population in this study is all students of class X SMA as many as 4 classes which amounted to 157 students of Year Learning 2016/2017. Sampling was done by random sampling. The sample used in this study consists of three classes, namely class X<sub>2</sub> used as experimental class taught by Problem Based Learning Model (PBL), class X<sub>3</sub> serve as experimental class taught by Group Investigation model (GI), and class X<sub>1</sub> become control class taught with Conventional models. All three groups were given early tests of critical thinking skills (pretest). After treatment, then the whole group is given postes to measure student's critical thinking skills.

The instrument used to measure critical thinking skills is a matter of multiple choice of 25 questions, compiled based on taxonomy bloom domain (C4-C6). The results of the research data are processed and analyzed gradually. The hypothesis was tested by using Covarian Analysis (Anacova) formula at significance level  $\alpha = 0,05$ . Ha (influence) accepted if the significance value  $< 0.05$  and vice versa. If the statistical test results indicate an influence then the analysis continued with the Scheff test. The processing is done by using SPSS 22.0 software.

## RESULTS AND DISCUSSION

A summary of the research results of student's Critical Thinking Skills (CTS) is presented in Table 1.

Table 1. Description of Student's CTS

Class	Pr Tr	Pr Tt	Po Tr	Po Tt	Mean		Std. Dev	
					Pr	Po	Pr	Po
<b>PBL</b>	28	84	68	96	57,60	81,60	12,38	7,72
<b>GI</b>	12	80	52	96	54,36	78,21	15,38	8,92
<b>Conv</b>	12	80	44	92	48,00	74,68	15,59	11,2

### Information:

PBL	= Problem Based Learning	PrTr	= The Value of Lowest PretestCTS
GI	= Group Investigation	PrTt	= The Value of highest PretestCTS
Conv	= Conventional	PoTr	= The Value of Lowest PostestCTS
Pr	= <i>Pretest</i>	PoTt	= The Value of highest PostestCTS
Po	= <i>Postest</i>		

**The effect of learning models on student's critical thinking skills:** The results of covariance analysis (Anacova) with the help of SPSS for windows 22.0 showed that the learning model had significant effect on student's critical thinking skills ( $F = 43,79$ ,  $P = 0,00$ ) with the pretest as covariant score had an effect on posttest value ( $F = 6660,48$ ;  $P = 0,00$ ). Furthermore Scheffe test results show that student's critical thinking skills learned by PBL learning model  $81,60 \pm 7,72$  is significantly higher than the learning model GI  $74,56 \pm 8,92$  and Conventional  $61,47 \pm 11,26$  as follows.

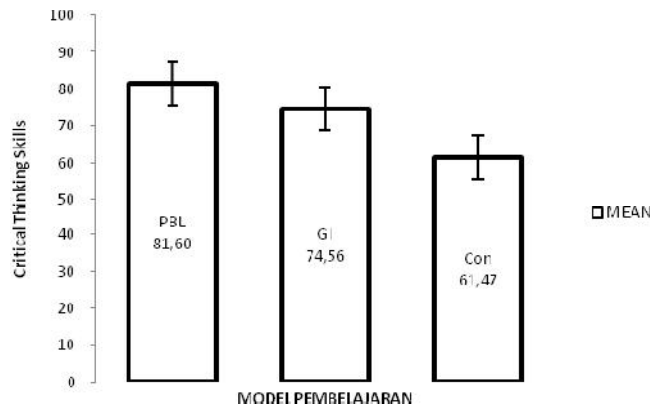


Figure 1. Influence of Learning Model on Critical Thinking Skills of Students Biodiversity Material (Plant) Level Type of Student. The different letters in the picture above mean significantly different (Scheffe Test).

Based on the result of posttest, the score of student's critical thinking skill on the biodiversity (plant) level material based on the indicator of critical thinking skills can be seen as follows:

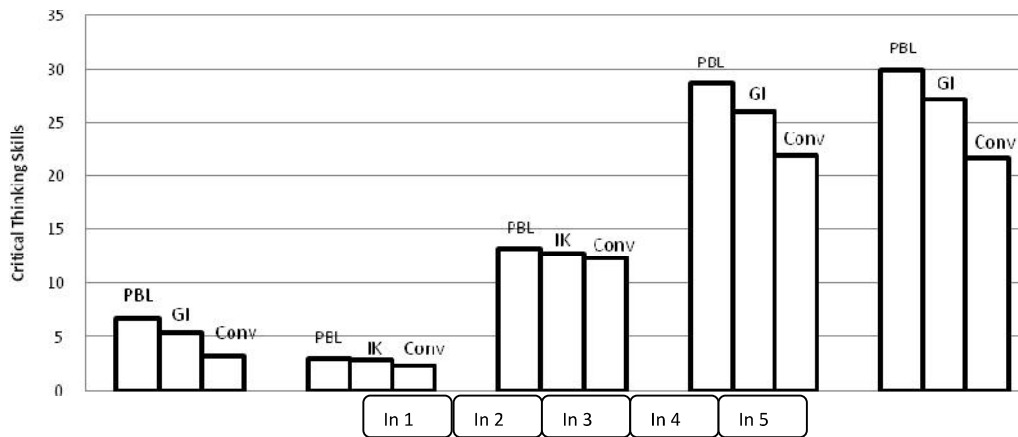


Figure 2. Student's Skills to Answer the Critical Thinking Skills Test of Biodiversity (Plant) Material Level Types Based on Critical Thinking Maintenance Indicators.

Indicators of Student Critical Thinking Skills:



- Indicator 1: Formulate the concept of uniformity of living things
- Indicator 2: Compare the characteristics of biodiversity at the species level
- Indicator 3: Recognize the varying degrees of diversity in the immediate environment.
- Indicator 4: Describes the role of diversity in environmental stability.
- Indicator 5: Analyze the possibilities that can occur if there is a change in the number and type of biodiversity.

## Discussion

**The effect of learning model on student's critical thinking skills:** The result of this research shows that there is influence of learning model to student's critical thinking skills. It is characterized by the average of student's critical thinking skill which is taught by Problem Based Learning model (PBL) is significantly different with the average of student's critical thinking skills which is learned by Group Investigation (GI) and Conventional model. Students who are taught by PBL model have the highest average critical thinking skill compared to GI or Conventional models. This is due to: (1) students can learn in small and heterogeneous groups; (2) students are invited to face real life situations that demand not easy answer; (3) students can analyze and define problems, develop hypotheses and make predictions, collect and analyze information, carry out experiments, make inferences and draw conclusions (Arends, 2008).

In problem-based learning, students are guided to think scientifically conducted systematically and empirically. Systematic means scientific thinking is done through certain stages using scientific methods, while empirical means the process of problem solving is based on data and facts are clear. Learning arranged in such a way is capable of demonstrating good critical thinking skills because knowledge construction is conducted with groups that allow each student to express an opinion, listen to the opinions of a group's peers, and jointly build understanding. Learning develops when learners participate actively in the learning process. Thus, learning process is no longer simply transferring knowledge from teacher to student, but also a process of obtaining concept oriented on student involvement actively and directly.

Then for the average critical thinking skills of students who are taught by the conventional model is the lowest compared with the learning model of PBL and GI. This is due to the conventional use of the conventional model. This learning activity centered on the teacher as speaker and communication happened in the same direction. Because the model used will maximize the learning of origin in accordance with the material, the allocation of time and school facilities. In conventional learning, students are seen as subjects who do not know anything and only accept knowledge from teachers. So the critical thinking skills of students will give a low average when compared with learning models PBL and GI.

The results of this study are in accordance with research conducted by Dewi (2012) which states that there are positive and significant influence of PBL model through experimental method to cognitive ability of C3, C4, C5, and C6 based on critical physics



thinking skill. With the PBL model, students' experimental activities on students' cognitive abilities also increased. The results of this study are also in accordance with research conducted by Suwondo (2010) which states that there is an increase in learning outcomes after the application of PBL model.

## CONCLUSION

Based on the results of research and discussion concluded that there is influence of learning model (Problem Based Learning, Group Investigation and Conventional) to student's critical thinking skills. The student's critical thinking skills which is taught by PBL model  $81,60 \pm 7,72$  is higher and significantly different compared to learning model of GI  $74,56 \pm 8,92$  and Conventional  $61,47 \pm 11,26$ . From the data, it can be concluded that the Problem Based Learning model is better than the Group Investigation and Conventional model on student's critical thinking skill on biodiversity material (plant) at the level of class X.

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