Application of Decision-Making Models to Improving the Critical Thinking Ability of High School Students on Biology Materials

Penerapan Model Decision Making untuk Membantu Meningkatkan Daya Berpikir Kritis Siswa SMA Pada Materi Biologi

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Abstract
The purpose of this research was to see the influence of learning and examples of decision making on improving the critical thinking skills of first grade students (X) on material change and environmental conservation in Bekasi High School. Researchers used the Quasy Experiment method with PrePost Control Group Design. The population in the study were first grade students (X MIPA 3) and (X MIPA 4) with the number of students were 35 and 34 students respectively. The technique for sampling was random cluster sampling. The exploration tool used is a 10-point skill test that integrates with indicators of critical thinking abilities or skills. Based on the results of the study, the average value of critical thinking skills or skills in the experimental group (=59.74) was higher than in the control group (=46.08). T-test (3.82) and t-table (2.97) were obtained when the hypothesis was tested using t-tests with a significance level of 1% and learning models such as decision making on improving the critical thinking skills of first grade students on environmental conservation materials at SMA Negeri Bekasi.
Keywords : Decision Making Learning Model, Critical Thinking, Environmental Change

Abstrak
Tujuan diadakan penelitian ini adalah guna melihat pengaruh pembelajaran beserta contoh pengambilan keputusan terhadap peningkatan kemampuan berpikir kritis siswa kelas X pada materi perubahan dan pelestarian lingkungan hidup di salah satu SMAN di Kota Bekasi. Penelitian ini dilaksanakan pada bulan April sampai Mei 2017. Menggunakan metode Quasy Experiment, dengan menggunakan PrePost Control Group Design. Populasi dalam penelitian ini adalah siswa X MIPA 3 dan MIPA 4 dengan jumlah siswa masing-masing 35 dan 34 siswa. Teknik untuk mengambil sampel menggunakan random cluster sampling. Alat eksplorasi yang digunakan adalah tes keterampilan 10 butir yang terintegrasi dengan indikator kemampuan atau keterampilan berpikir kritis. Berdasarkan hasil penelitian, rata-rata *nilai kemampuan atau keterampilan berpikir kritis pada kelompok eksperimen (=59,74) lebih* tinggi daripada pada kelompok kontrol (=46,08). t_{hitung}(3.82) dan t_{tabel}(2.97) diperoleh ketika hipotesis diuji dengan menggunakan uji-t dengan taraf signifikansi 1% dan model pembelajaran seperti pengambilan keputusan *decision making* pada peningkatan kemampuan berpikir kritis siswa kelas X pada materi konservasi lingkungan di SMA Negeri Bekasi.
Kata Kunci: Model Pembelajaran, Decision Making, Berpikir Kritis, Perubahan Lingkungan

INTRODUCTION

Searching for knowledge is a human right and obligation that is very influential, and inextricably separated from human life, even from the cradle to the end of its life (Fatmawati et al., 2014) . There is a saying that man cannot be separated from the learning process in man's time and place, which means that man cannot be separated from education. UU RI No. 20 Tahun 2003 tentang Bab II Bagian Pendidikan Nasional Bab 3 (BNSP, 2006) claim that public education was an activity to advance the character of a glorious nation of public health education, with the intent of increasing its resources.

This may indicate that education would enable a country to provide human resources ready to meet the demands of the age development, which would bring technological progress. The quality of a good educiion will result in good human resources. In view of the Indonesian educational system is still conventional and traditional, where learning in Indonesia is still dependent on teachers (teacher centered learning) which is affecting passive students in the event of learning is only listening to the teacher's explanation (Salay, 2019). The self-taught system of students centered can help students discover concepts, principles, and facts firsthand therefore it can trigger students' pathological thinking and can also train students in critical thinking in learning and in solving a problem faced. And will be applied in real life once they return to society (Fatmawati et al., 2014).

Advances in cognitive science in the 21st century have increased our understanding of mental processes involved in thinking, thinking and thinking (Dowd, et al., 2018). Critical thinking is a way of thinking (about material, substance, or any problem) in which thinkers improve their thinking quality by manipulating embedded thinking structures and applying intellectual standards to them (Fisher, 2001). As noted above, having critical thinking is the most important skill in real life (Erceg et al., 2013). Based on some of the opinion of previously presented experts, it can be concluded that critical thinking is not easy for students to trust information without the first analysis process to ensure that the information is trustworthy. The fact that high school students' critical ability or thinking skills are still at a low level because of the learning model used by teachers who are always lecturing and discussing.This is what researchers have discovered while conducting a field experience program (PPL) at one of bekasi city high schools, where when discussing biological matter, educators tend to overlook opportunities for students to develop abilities and thus fail to teach students to make appropriate, quick and correct decisions.In the learning process, educators tend to give only problems to discuss and then leave students to resolve them on their own without a process of decision making that can improve students' critical ability or thinking skills.Decision making is expected through the presentation of basic, concluded, making further clarification (Eren & Öztuğ, 2020) of critical thinking relationships with decision making (Ludin, 2018). Critical assessment is part of critical thinking that focuses on how to take away a vote (Sharples et al., 2017). While deciion making is decision making.

Thus one solution to the problem is with the use of learning from a mock decision making, essentially used to promote critical thinking..

The learning model is very close to critical thinking that can be defined asa process of self-assessment that will encourage problem solving (Greenwald & Quitadamo, 2014), where the most important thing to do is analyze hypotheses, rational & mortification, step evaluations, and the last to do a survey and decision making (Saputra, 2020). Besides, forebodes or memorabilia will affect critical thinking (Indraswati et al., 2020). Decision making may be defined as focusing attention on a process in which the alternatives are evaluated and the selected choices can be implemented (Smith, 2003). Proper decision-making skills are also known as critical thinking ability as well as problem solving skills with logical thinking and selective thinking (Puteri et al., 2014). Critical thinking ability using decision making enables selected decisions to buy time to solve problems and can solve them if decisions are taken with a deficiency (Andika & Setyarsih, 2019). From the above statement, itis very clear that the decision-making learning model has a bearing on critical thinking.

The focus of discussion chosen in this study is the change and preservation of the environment, and the focus of the environmental change discussion includes environmental issues that arise in the student ward in the student ward that are customed with the teaching model used, as well as critical thinking skills. Necessary when mastering the focus of this learning. In view of the research done by (Huda & Naelofaria, 2020), the update in doing this study is using the decision-making learning model on critical thinking skills in the x - class students at one of the high schools at the tangerang. Based on research by (Novia et al., 2021) that use both types of decision making but to see how it affects the student's ability or creative thinking skills, while what researchers do is renewal where researchers focus on the student's critical thinking ability.According to (Fardiani et al., 2020), the use of decision-making learning models to enhance critical ability or skills for students. The above is an explanation in applying a cooperative learning model type of decision making and being able to increase creativity in student critical thinking and be able to achieve educational goals.

METHOD

The study is a quantitative study, with the quasy experiment (artificial experiment) that can also be called pre-experimental (Effendi, 2013), where outdoor variables can significantly affect experimental results. Using design design design design design design precursor posttest design. Pretests were made on early samples, and they gave the sample group an alignment of conditions, while posttests were done at the end of the study. This posttest is necessary in seeing the difference between experiment class and control class.

This difference will be a deduction as to whether decision making has an impact on the critical ability or thinking skill of high school students in the developmental biology of environmental change. The study was located at the tanggerang public high school. The samples taken on this study amount to two classes, an x science 3 and an x science 4. Which was used as a control class and an experimental class. Where the number of control class students numbered 35 students, and experiment classes numbered 34 students, where different treatment of the two classes was given. The characteristics of the

samples on this research are female and male. As for picking up samples using random sampling techniques, by selecting 2 science class X students from the entire X science class.Instruments in this study use an issue of description to observe students' critical thinking ability changes both in the control class and in the biology matter experiment class on the subject of environmental change. The value of the difference between pretest and the posttest of both experimental and control classes that were subsequently analyzed using t-test analysis. The procedure on research is divided three stages between the stage, the stage is preparation, execution and the final stage. The preliminary phase begins with getting permission from school authorities, and then researchers develop instruments that will be necessary for the retrieval of research data. Then researchers communicate the instruments to the experts to test the worthiness of the instrument using the validity test.

This validity is indispensable because it can describe the instrument's ability to measure. And then there is a religious test, after a valid instrument and one of the tests is continued with the level of hardship and the instrument's opposite power. As it feels right then the instrument is corrected. Until a worthy instrument is used as a data collector. The next phase of the study is initiated by giving pretests using valid, religious instruments and having been tested to varying degrees of difficulty. And has been adjusted to critical skill or thinking skills. And are given to the X class of ipa3 as well as the X science 4 as a control class and experiment class. The application of this model takes place five times in a row. Whereas the learning activities in X science 3 classes are done the way teachers used to communicate materials using materials dominated by the talking and discussion methods.Further in analyzing pretest data and postest used test-t analysis. Tests-t are used in order to obtain the results of each variable independently of the independent.

RESULT AND DISCUSSION
RESULT

The results of the studies include pretest scores: control class, experiment class and posttest class control, and experiment class. Data analysis results in a difference between pre-test values, post-test of students' critical ability or thinking skills materials on the subject of change and environmental preservation. Here's table 1.

Table 1. Comparison of *N-Gain* result (Experiment & Control class)

Class	$\overline{X}$	SD	Min.	Max.
Eksperimen	59,74	13,16	29	81
Kontrol	46,08	16,43	11	76

Table 1 shows an acquisition of n-gain in experiment and control classes, of critical ability or thinking skills. From data gains the rate of n-gain experimental classes higher than the control class. This distinction must be due to treatment. To make sure there is or is not any difference it is necessary to make do with the test. Test results are in table 2.

Table 2. Result Analysis of t-Test (experiment & Control class)

Class	$\overline{X}$	t_{hitung}	t_{tabel}	Ket.
Eksperimen	46,08			Berbeda
Kontrol	59,74	3,82	2,92	signifikan

Based on table 2 obtained that value thitung > ttable. Thus rendered zero is rejected and h1 is accepted, then shiva's critical thinking ability is class x. science 3 and x. science 4 has a very significant difference. It could be said that there is a difference between a class that USES the decision making learning model and a class that USES conventional methods or talks. Apart from the differences in n-gain results of the two classes, students' critical thinking skills can be seen from whether or not students answer questions in each indicator. The dial indicator is the critical indicator of thinking. Below is shown the average value of each critical skill or thinking skill (see picture 1). Picture 1 shows information about percentage comparisons of each indicator. There are six critical indicator of thought observed. There is a greater percentage of each class indicator of experimentation than in the percentage of each control class indicator.
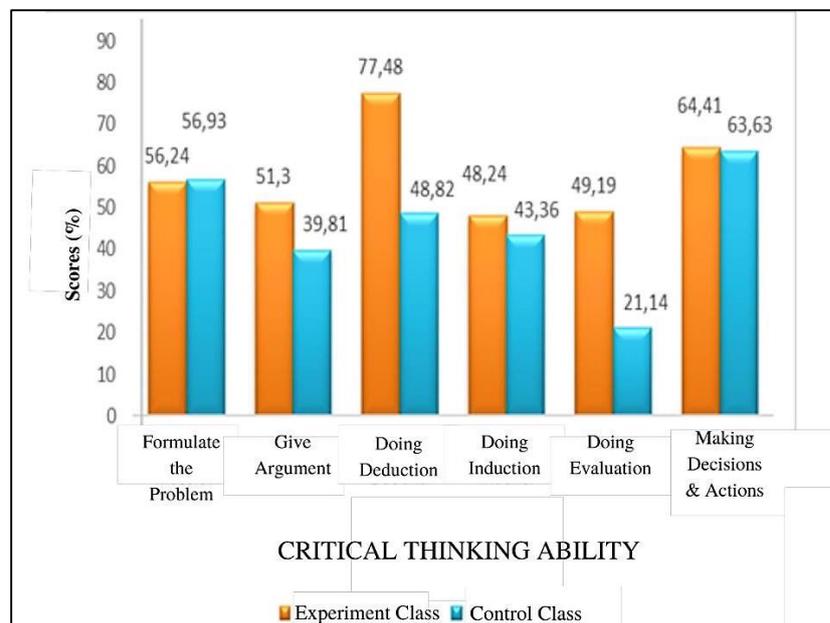
Picture 1. Comparison of Critical Thinking Values in each Indicator in the Control and Experiment Classes

DISCUSSION

By looking at analysis of the results on the hypothetical test, it was found that thitung (3.82) > ttable (2.92) means there is a very significant difference in both classes' critical thinking ability to the class X science 4 and X science 3 at the state high school was attacked. The difference is seen between the class of decision making learning model of an experiment and a class that USES the discussion and lecture method of control class. Students who are capable of thinking critically on the class experiment on biological matter on change, and the preservation environment has better material mastery than the students in the control class. It matches the results of the n-gain pretest and the postest in experiment and control classes. Average results - the average n-gain in experiment class of 59.74 and in control class of 46.08.

Using the decision-making decision model in experiment class, training students to develop knowledge through discussion activities and training students to make the

right decision to solve a problem. This study, as did studies made by (Syafaruddin & Anzizhan, 2004) that decision making is a process of making decisions to solve a problem in order to achieve the best goals. By identifying the issues themselves and making decisions on how to solve them will provide a concrete experience for the decision-maker. It also enables students to communicate well with their fellow members and to express their opinions to each other, so that the student can become a source for his or her companion and eventually learn to be more meaningful During the learning activity, all students are asked to be directly involved and can actively contribute. The teacher's function is just being a motivator and a facilitator. Mature learning is accomplished as learners actively participate in the learning process (Siew & Abdullah, 2013). It also enables students to communicate well with their fellow members and to express their opinions to each other, so that the student can become a source for his or her companion and eventually learn to be more meaningful. This agrees with the statement (Hanifah, 2008) that the decision making model of decision can increase learners' involvement in learning while also improving students' creative ability..

The control class has a critical brainpower level that is less than an experiment class. This is because the learning activity in the control class applies an espresso model, in which the teacher more dominates, the learning process generally takes place by the talk method. This type of learning process relatively leaves students without the opportunity to develop the ability to solve problems and decision making. Thus, the capacity for critical thinking is lacking. It is just as it was said (Puteri et al., 2014), that the teacher who always closes for students to study without giving instruction on how to study well and how to solve problems that will cause students to be so casual about the teaching learning process that itis weak critical thinking.

The student's critical ability or thinking skills can also be seen on the basis of the skill indicators that are viewed from formulating problems, expressing opinions, deducing, induction, assessing and making decisions and decisions. In the student experiment class the results have an achievement of the highest average n-gain presentation on the indicator doing deductions by the number of 77.48% percentages, this result is far better than the average indicator of doing deductions in the control class that only up to 48.82. This is because the student experiment class has been accustomed to taking and analyzing conclusions from the general to the most specialized at learning. Based on the data listed in table 1 and table 2 and the existing theory-tori version, it has been told that a decision model of learning has a type to influence the student's critical ability or thinking skills reflected in the postest results, where the description used includes six indicators of critical ability or thinking skills that would like to be measured.

This is happening because the implementation of decision type learning models makes students feel relaxed in their studies, students do not feel held back and feel that learning done is more exploring students' knowledge and reasoning can even give students an opportunity to be more active and critical in identifying and formulating problems. Additionally, students may also make arguments in their own when determining some completion alternatives. A study said that there is a critical, sobering relationship with decision making (Ludin, 2018). Making decision judgments can help think critically in harsh judgments(Ristanto, Djamahar, Heryanti, & Ichsan, 2020). In

reality many of the ideas given in making decision are needed in prioritizing the best altenative action (Org & Lockwood, 2021).

CONCLUSION

Decision making decisions may be decided to influence the critical ability or thinking skills of x science class students, on the biology of change and environmental preservation. Acquired t-test > t-table 3.82 > 2.92. That means repel h0, and accept H1. This suggests, that the use of decision making models is beneficial and increases students' critical ability or thinking skills. Based on the results of this study, use of decision making can improve critical thinking ability. Therefore, teachers are advised to use this model as an alternative model in improving critical thinking ability.

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