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THE IMPLEMENTATION OF CONTEXTUAL LEARNING TO ENHANCE BIOLOGY STUDENTS' CRITICAL THINKING SKILLS

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ABSTRACT

One of the life skills exceedingly be required in the globalization era is critical thinking skills; therefore, every level of education has a role in enhancing critical thinking skills of students, especially biology students'. This research aimed to determine the efforts to enhance the critical thinking skills of students' in biology subject through a Contextual Teaching and Learning (CTL). This research used a quasi-experimental method with a total sample of 62 X grade students at SMA Negeri 4 Sintang. The data of critical thinking skills were obtained from pre- and post-test results with essay test instruments. The data were analyzed descriptively employing an inferential statistic with T-test. The inferential statistical analysis revealed that there was a difference in the critical thinking skills between the CTL learning and the expository learning ($t = 5.98 > 1.83$). The posttest average score of students' critical thinking skills in the CTL learning was 82.56 and categorized as very good. The post-test average score in the expository learning was 68.37 and categorized as fair. The average score of critical thinking skills in the CTL learning increased by 36.06 while the average score of critical thinking skill in the expository learning increased by 19.42. The results of this research concluded that CTL learning was better to enhance the critical thinking skills of students' in biology subject on the learning material of environmental pollution.

Keywords: critical thinking skills, CTL learning, biology education

INTRODUCTION

The low quality of education can be seen from teachers' teaching styles. In general, the learning process in high school level remains to use conventional learning such as textbook and teacher-oriented which result in a passive and unrelated learning to real life. Consequently, students' critical thinking skills are not developed well and finally influence their learning outcome. This is line with Wulandari et al. (2015) who stated that the low students' critical thinking skills were initiated by passive learnings. The low critical thinking skills can be seen from a research conducted by Muhlisin (2012) which revealed that 80,9% biology students' critical thinking skills belonged to a low category. Furthermore, Fuad et al. (2017) showed biology students' critical thinking skills scored only 21.89 averagely and categorized as low.

The low biology students' critical thinking skills were caused by less optimal learning strategy, models, method and process (Bustami & Corebima, 2017). The field facts explained that teachers commonly employ expository learning. Teachers become the primary source and informant, resulting in active teachers yet passive students. In addition, students were not given much opportunity to express their opinions on the concepts being studied. This certainly can cause the

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students' low critical thinking skills. This is parallel to Hairida (2016) that a teacher-centered teaching-learning process could not improve students' critical thinking skills.

Anazifa & Djukri (2017) said that learning activities in schools have not yet improved students' critical thinking optimally. More importantly, the increase in students' creativity and critical thinking skills in learning biology has not been a serious concern in the learning activities. Research by Choy & Oo (2012) showed that many students' could not think critically because their teachers could not integrate critical thinking into their instructional practices every day. Muhlisin et al. (2016) also explained that the learning method or learning model used is less able to critical thinking skills develop. This was in tune pinion Corebima (2016) revealed that the learning process of biology is almost certainly not interested in empowering critical thinking skills of learners.

In fact, one of the life skills required in this globalization era is critical thinking skills (Khasanah et al, 2017; and Anazifa & Djukri, 2017). The critical thinking skills is an essential skill in life and the working world; also, it has an effective function in all other aspects of life to improve human beings quality. According to Abed et al. (2015) and Wartono et al. (2018), critical thinking skills are a superior ability which plays an important role in all aspects of life. The critical thinking is a reasoned, reflective thinking emphasizing on making decisions about what to believe and do (Novitasari, 2015). Learners having critical thinking skills will be able to ask the right questions, give effective and efficient information, have a plausible reason, be creative, incorporate relevant problem-solving, make decisions, and have consistent as well as credible conclusions (Bustami, 2009; Ku, 2009; Fisher, 2009; Carter et al., 2016). In addition, Facione (2010) said that the core of cognitive skill is the critical skill, and Corebima (2009) explained the test indicator achievement is basically the effect of the success of critical thinking.

Based on the above facts, it is important to improve biology students' critical thinking skills through various innovative learnings. Innovative learning can make the students actively involved in learning, to do a collaboration and self-directed learning. Innovative learning could shift the educational paradigm from teaching to learning and from teacher-centered to student-centered (Bustami & Corebima, 2017; Karim et al., 2018). One of the innovative learning strategies is a Contextual Teaching and Learning (CTL). According to Khoiron & Sutadji (2016), CTL is a learning process that helps teachers to associate the teaching materials with real situations and encourage the students to arrange a scientific approach and apply it in daily life. CTL enables students to connect the content of teaching materials with the daily context to find the purpose of learning (Susialita, 2016). The CTL concept was also revealed by Muslich (2009) and Rusman (2011) who elucidated that contextual learning helps teachers in connecting what is conveyed using a different world of students and encourages the students to think by discovering and connecting their knowledge to the surrounding reality.

On the other hand, CTL also allows students to work together and share ideas as well as encourage students to be confident to express their opinions and be able to explain the results of the discussion in front of their friends. Group discussion provides opportunities for students to participate and think together to complete learning tasks to understand the studied materials and prepare to present answers (Wulandari et al., 2015). The characteristics and stages of CTL allow biology students to enhance critical thinking skills.

Considering the importance of critical thinking skills and the need of active learning by linking the learning materials to the real-world situations, it is necessary to conduct a research on the implementation CTL learning to improve biology students' critical thinking skills in learning environmental pollution. This research aimed to enhance biology students' critical thinking skills through CTL learning. The research hypothesis was that CTL learning could enhance students' critical thinking skills in biology subject.

METHODS

This research used a quasi-experimental method with pretest-posttest non-equivalent groups design consisting of two classes, namely experimental and control class aiming at comparing the critical thinking skills of biology students' in the experimental and control class. Each class was given a pretest and a posttest using the same test items related to students' critical thinking skills in environmental pollution subject. The treatment class was taught by using the CTL learning, while the control class was taught by using expository learning. The differences in learning activities between the two classes are presented in Table 1.

Table 1. The Differences between CTL and Expository Learning

CTL	Expository Learning
1.Introduction Teacher states the learning objectives	**1. Preliminary** Teacher states the learning objectives
2.Invitation Students express their prior knowledge associated with their real-world situations	**2. Presentation** Teacher delivers abstract material to students verbally.
3.Exploration Teacher gives a problem to students to be solved cooperatively in groups through investigation activities	**3. Exploration** The teacher gives a problem and the students solve the problem individually through student worksheet (LKS).
4.Explanation and Solution Students present the results of their investigation and do question and answer session among the groups accompanied by the teacher	**4. Recitation** Students do the exercises on the student worksheet (LKS) given by the teacher
5.Taking Action Students make decisions or conclusions based on their own knowledge	**5. Drawing Conclusion** The teacher draws a conclusion on the learning material
6.Closing Students work on the quizzes given by the teacher individually	**6. Closing** Teachers provide reinforcement by asking questions orally to students

The population in this research was all X grade students of SMA Negeri 4 Sintang consisting of 3 classes; XA, XB, and XC with the total of the population was 97 students and the total of the sample was 62 students. There were 32 students in the experimental class (XB), and 30 students in the control class (XC). The sampling techniques of the experiment class employed simple random sampling. This technique was chosen because each sample had similar capability derived from the placement test analysis results.

The data collection instrument was in the form of test questions. The test questions were essay tests related to indicators of critical thinking skills. The students' critical thinking skills were measured based on the indicators developed by Richard Paul and Linda Elder (Ege, 2010) from the Foundation for Critical Thinking which covers: (1) questions to the problems, (2) objectives, (3) concepts, (4) assumptions, (5) information, (6)interpretation and drawing conclusions, (7) points of view, (8) implications and causes. The test items had been validated by an expert team and had been tried out to know the validity and reliability of test items. The results of the validity calculation showed that the t-count was larger than the t-table (the validity value of the t-count was 55.76 and the reliability of the r-count was 299.81). This means that the test items were already valid and reliable so that they met the criteria of critical thinking skills, and feasible to be utilized as the research instrument.

The data were analyzed descriptively based on the average score, then an inferential statistic with T-test was carried out. Before the t-Test, a prerequisite test was done; a normality and homogeneity test. The test results on both pretest and the posttest for each sample from the population were normally and homogeneously distributed (value: $p>0.05$). Therefore, it could be proceed to the parametric analysis (hypothesis test) through T-test.

RESULTS AND DISCUSSION

The average score of critical thinking skills of biology students was obtained from the pretest and post-test average scores of class XB and XC. The range of critical thinking skill categories is presented in Table 2.

Table 2. The range of Critical Thinking Skill Categories

No	Range	Categories
1	80 -100	Very good
2	70 – 79	Good
3	60 – 69	Fair
4	50 – 59	Low
5	≤ 49	Very low

The descriptive results showed that there was an increase in the average score of students' critical thinking skills in biology subject both in the experimental (CTL learning) and control class (expository class). The average score of biology students' critical thinking skills in CTL learning was bigger than in expository learning. The detailed explanation of the increase is presented in Table 3.

Table 3. The Pretest and Posttest Average Score of Biology Students Critical Thinking Skills

No.	Learning Method	Score		Increase
		Pre-test	Post-test	
1	CTL	46.50	82.56	36.06
2	Expository	48.95	68.37	19.42

The descriptive analysis results in Table 3 show that the pre-test average score of in the experimental (CTL learning) and control class (expository class) categorized as low. The pre-test average score in CTL was 46.50 and in the expository learning was 48.95. The post-test average score of students' critical thinking skills in CTL was 82.56 and categorized as very good while in the expository learning was 68.37 and categorized as fair. The critical thinking skills of students' average score in CTL increase by 36.06 while in the expository learning increased by 19.42. The increase of students' critical thinking skills in biology subject could be illustrated in Figure 1 showing that the average score of students' critical thinking skills before and after the learning was different between the CTL and expository learning.

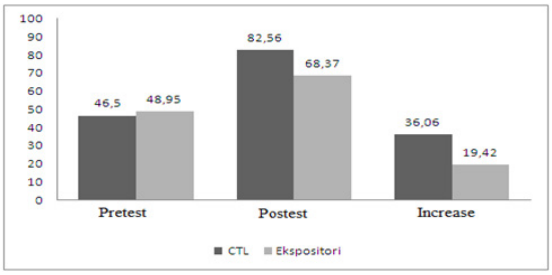

Figure 1. The Histogram of Biology Students' Critical Thinking Skills Average Score

The research results showed that CTL could enhance biology students' critical thinking skills. These research results are in line with the research conducted by Komalasari (2012) and Sugiarti (2012) which elucidated that there was an increase in students' critical thinking skills through CTL. Other researchers have also shown that there was an increase in students' critical thinking skills on colloids concept by using the CTL (Wulandari et al., 2015). The improvement of critical thinking skills could not be separated from the selected approach; CTL. The learning process employing CTL requires students to be brave to actively participate in exchanging ideas, expressing their opinions and explaining the discussion results in front of their friends (Wulandari et al., 2015). The courage to express opinions sharpens the students' critical thinking skills. In addition, according to Ridhayani & Manurung (2010), CTL could improve students' conceptual understanding since it is supported by the increased of students' critical thinking skills.

The purpose of T-test was to describe whether there were differences of the critical thinking skills average score between the biology students' in the experimental and control class. The recapitulations of the T-test results are presented in Table 4.

Table 4. The Pre-test and Post-test Analysis of Critical Thinking Skills (CTS)

Test	t-count	t-table (0.05)	Description	Conclusion
Pre-test of experimental and control class	-0.58	1.83	H_0 accepted	No difference of critical thinking skill
Post-test of experimental and control class	5.98	1.83	H_1 accepted	There was a difference of critical thinking skill

The T-test results analysis of the pretest showed that there was not any difference in the critical thinking average score in both the experimental and control class are displayed in Table 4. The analysis results revealed that the t-count was smaller than t-table. Thus, the requirements of quasi-experimental research were met, and that both the experimental and the control class must have the same thinking skills.

The T-test results for the posttest data in Table 4 indicated that there was a different average score between the students in the experimental and control class on the environmental pollution subject. The t-count was higher than t-table; thus, it concluded that CTL was better than the expository learning in improving students' critical thinking skills. This research is in line with the research conducted by Manao (2013) and Kur-

fiss (1988) that students' critical thinking skills with CTL were significantly different from those in conventional learning. This corresponds to the opinion of Johnson (2002) who revealed that CTL was more productive and able to reinforce students' conceptual understanding because CTL embraces a constructivism, in which the students are led to discover their own knowledge.

On the other hand, the stages of CTL enable to encourage critical thinking skills. The CTL stages such as invitation and exploration stage would support students to express their initial opinions within a group so that they will be trained in giving their arguments about the studied materials. According to Ariyanti et al. (2013) learners who often exchange ideas, information, and argument in groups would increasingly form critical thinking skills.

In addition, the explanation and solution stage require students to conduct an investigation in groups. These stages urge students to be cooperative in conducting an investigation in order to be able to solve the given problem. This is similar to DeHaan (2009) that discussion and mutual help in solving problems will hone students' critical thinking skills. Stage of explanation and solution also encourage students to interpret, analyze, interpret and assume existing data. Interpretive skills of analyzing, interpreting and assuming are the hallmarks of critical thinking. Finally, the last stage was taking action. Here, the students are trained to make decisions and draw conclusions. Contextual learning could provide opportunities for the students to improve, extend, and apply their knowledge and skills in various activities both in schools and daily life. Contextual learning emphasizes higher-order thinking and knowledge transfer by gathering, analyzing, and synthesizing information from different points of view (Burhanuddin, 2012). In other words, CTL requires the students' to experience rather than memorize, to think, and to be active. As a result, they were able to construct knowledge based on their own experience.

CONCLUSIONS

Based on the analysis results and discussion, it concluded that the critical thinking skills' average score of the students in Biology before the implementation of CTL was very low. However, after the students experienced learnings with CTL, their scores enhanced and categorized as very good. Moreover, there was a difference in the average score of critical thinking skill posttest in the experimental (CTL) and control class (expository learning). In addition, the students' critical thinking skills who learned using CTL were better as well as significantly different from those who learned to employ expository. Thus, CTL was better than the expository learning in improving students' critical thinking skills, particularly on the environmental pollution topic.

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