
HOW TO EMPOWER STUDENTS' CRITICAL THINKING SKILL IN HIGHER EDUCATION THROUGH JiRQA LEARNING STRATEGY: A REVIEW OF INNOVATION COOPERATIVE LEARNING STRATEGY

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ABSTRACT: Critical thinking is the essential element which is important in education. Critical thinking enables the students to increase knowledge and skill, so some efforts have been done by higher education to empower critical thinking skill. One of the efforts is through cooperative learning strategies such as JiRQA (Jigsaw, Reading, Questioning, and Answering). This research was a quasi-experimental research using nonequivalent control group design. This research was conducted at STKIP Persada Khatulistiwa Sintang, Indonesia. The population of this research was all the students of biology education program with the total of 586 students. The sample of this research was the students who programmed zoology course on the even semester of the 2015/2016 academic year with the total sample of 125 students. The data of critical thinking skill were obtained from essays test. The data were analyzed by using analysis of variance (ANOVA) at the 5% significance level ($p < 0.05$). The results of the analysis showed that the JiRQA learning strategy was more potential in empowering critical thinking skill of biology students.

KEYWORDS: Cooperative learning strategy, JiRQA, critical thinking skill, higher education.

INTRODUCTION

Critical thinking is the essential element which is important in education. (Klimovienè, 2006). Some of higher educations in the world considers that critical thinking is one of indicators which are important to be developed (Quitadamo & Kurtz, 2007; Zhixin Su, et.al, 1995). The Association of American Colleges and Universities (AACU) reported that "93% of higher education faculty perceived analytical and critical thinking to be an essential learning outcome" (AACU, 2005). It is based for critical thinking will be able to create intellectual force in acquiring knowledge in the field. Klimovienè (2006) stated critical thinking enables the development of knowledge and skill.

On the other sides, thinking has some functions such as reasoning, concept formatting, critical and creative, decision making, and problem solving (Kirkley, 2003; Santrock, 2008). Furthermore, Bustami (2009) explained in addition to solve problems, critical thinking skills also make learners have a better skill in arranging the plan systematically. Critical thinking skill is also required by the students to prepare them in working place (Nokelainen & Kirsi, 2011; Ananiadou & Claro, 2009), and develop logical thinking process (Ennis, 1996). Thus, the empowerment of critical thinking skill is the objective in education, especially in higher education.

Higher education has the strategic role in developing critical thinking skill. The empowerment of students' critical thinking skill in higher education can be done through learning process. In learning process, educators not only succeed the learning process but also they have to explore the different pedagogy to improve students' critical thinking, to solve misunderstanding and motivate students (Valdez, 2015). Students should be challenged with assignments that refer to the skill and knowledge which beyond their mastering level at this moment (Clarke, 1991). To achieve that, the existence learning process requires the involvement and students' active role, students' collaboration and self directed learning (Tan, 2003).

Strategy, model and method that are used is hoped to be able to create student-centered learning process (Shan-Ying Chu, 2014). Students are hoped to be able to construct their knowledge through their learning experience. Learning experience aims to support the students to find, to reflect, and increase their critical thinking in general (Quitadamo & Kurtz, 2007) while the lecturers are their fasilitator (Klimovienè, 2006; Valdez, 2015). Kulthau (2007) and Brickman (2009) explained that as fasilitator, the lecturers are hoped to have the role in guiding the students through building the knowledge and understanding to students' independence. Independence can be achieved if learning process is done interactively. Interactive learning will make students more willing to ask a question, to give argument, to do the deduction and induction, to give conclusion. All of those are the indicators of critical thinking skills.

One of learning strategies which is able to create interactive learning process is cooperative learning strategy (Nezami, 2013). According to Klimovienè (2006), cooperative learning strategy is effective in empowering critical thinking skills. Cooperative learning strategy can give the chance to the students for arguing each other during learning process. Slavin (2010) explained that arguing activity in cooperative learning can trigger the formation of someone's critical thinking skill.

Cooperative learning strategy has many types. One of them is JiRQA strategy. JiRQA strategy is able to involve students actively through some stages in learning activities. The stages in JiRQA learning activity such as forming the group, discussing, reading questioning, answering, and peer tutor are considered to be able to help the students to improve biology students' critical thinking skill.

LITERATURE REVIEW

Critical Thinking Skill

Skill of critical thinking is one of life skills in the current 21st century (Trilling & Fadel, 2009; Greenstein, 2012; Michael, 2012). According to Piaget dan Vygotsky, critical thinking skill can develop higher-level of thinking (Blake & Pope, 2008). It is because critical thinking is strongly attached with bloom taxonomy, especially in the analysis and synthesis indicators (Klimovienè, 2006).

Several literatures have provided definitions for critical thinking. According to Ennis (2001), critical thinking is a way of thinking reflectively which is reasonable or based on reasoning that is focused on deciding what to believe or do. Priyadi (2005), critical thinking is a mental process to analyze or evaluate information. The information can be obtained through observation, experience, common sense, or communication. Hadi (2007) explains critical thinking as a skill of an individual to see and solve problems. Klimovienè (2006) defines critical thinking a way of thinking that focuses on the ability to identify, create questions, critice, analyze, develop arguments, make decisions, conclude, and communicate problems. Critical thinking is also a way of delivering different arguments based on different value and language used (Costa & Presseisen, 1985).

Eggen & Kauchak (1996) elaborates critical thinking as: 1) a desire to obtain information, 2) a tendency to look for evidence, 3) a desire to figure out both sides of the entire issue, 4) an attitude of open-mindedness, 5) respecting others' opinions, 6) tolerance towards ambiguity. Lewis & Smith (1993) states that critical thinking skill is a part of high-level skills of thinking, there are at least three meanings for critical thinking, namely: 1) critical thinking as a problem-solving, 2) critical thinking as an evaluation and consideration, and 3) critical thinking as a combination of problem solving, evaluation, and consideration.

According to Ennis (2001), critical thinking skill consists of six components, i.e. formulating problems, giving arguments, deducting, inducting, evaluating, and deciding and implementing. The following Table 1 presents the full indicators and aspects of critical thinking skill.

Table 1. Skills and Indicators of Critical Thinking Skill

No.	Critical Thinking Skill	Indicator
1	Formulating problems	<ul style="list-style-type: none"> • The formulation of questions that give direction to get the answers
2	Giving arguments	<ul style="list-style-type: none"> • Arguments with appropriate reasons • Indicating similarities and differences • Intact arguments
3	Deducting	<ul style="list-style-type: none"> • Deducting logically • Logical conditions • Interpreting questions
4	Inducting	<ul style="list-style-type: none"> • Investigating/collecting data • Making generalization of the data, creating table and graphic • Drawing conclusion related to the hypothesis
5	Evaluating	<ul style="list-style-type: none"> • Evaluations provided on the ground of facts • Based on principle or manual • Giving alternatives
6	Deciding and Implementing	<ul style="list-style-type: none"> • Selecting possibilities for solutions • Determining possibilities to be implemented

Critical thinking skill is constantly evolving and able to be studied. To develop critical thinking skill can be done through a process of learning and assessment (evaluation). According to Corebima (1999), to enhance the ability or skill of critical thinking, the learning implementation and its evaluation must be managed deliberately to support the interest, in the case of implementation that must be taken seriously which are the approach, strategy, method, and other matters of learning technique.

A learning strategy such as cooperative learning is able to develop critical thinking skill (Klimovienè, 2006). It is due to students are given the chances to brainstorm ideas, to express different views of ideas, to implement, to evaluate, and to provide solutions, and at the same time also to help them in becoming better listeners, speakers, readers, and writers. In addition, the development of critical thinking skill through cooperative learning is resulted from the existence of interpersonal contact that creates interdependency and a common goal, equal status among members, and the educators play as facilitators.

Related to assessment, according to Puskur (2002), the implementation of Bloom taxonomy on assessment paper and pencil test still becomes a thrustworthy indicator in encouraging the creation of critical thinking skill. This is in line with Marzano, et al (Corebima, 2005) that we need to expand the concept of test to include aspects of a richer and more dynamic way of thinking. In dealing with the measure of thinking skill during the learning activity, Costa in Corebima (2005) uses three different approaches to measure the critical thinking skills of learners which are through objective questions, essays, and vocabularies of Critical Thinking Skills.

COOPERATIVE LEARNING TYPE JiRQA STRATEGY

JiRQA learning strategy is one of the cooperative learning strategies based on constructivistics which is initially developed and tested by Bustami at STKIP Persada Khatulistiwa Sintang, Indonesia (Bustami, 2016). It is an adoption of jigsaw strategy by Slavin dan colleagues at John Hopkins University (Slavin, 2010), and from the strategy of reading, questioning, and answering (RQA) by Corebima at State University of Malang (Corebima, 2009). Cooperative learning strategy type JiRQA is the integration of the syntax between jigsaw learning and reading, questioning, answering (RQA) learning.

The process of combining syntax is conducted on the basis that syntax of jigsaw strategy has a weakness where students sometimes fail to explain it to the group due to lack of students' interest in

reading (Budiningarti, 1998). Therefore, a specific strategy is required mainly RQA strategy to cover the weakness exists on jigsaw strategy. Corebima (2009) reveals that the RQA strategy implementation will be able to encourage students to read course materials and comprehend the content of reading, and also attempt to find out substantial parts of the content. Furthermore, Bahri (2010) explains that once the substantial reading contents are found, learners are ready to create inquiries on the individual basis. Thus, the integrated strategy of jigsaw and RQA will be able to cover the existing weakness so that the learning process can be maximized.

The implementation of JiRQA learning strategy covers seven main stages, i.e. (1) delivering the lesson topic, (2) the formation of heterogeneous home group, (3) Reading, Questioning, Answering activities within the home group, (4) the formation of expert group, (5) discussion activity in the expert group (6) discussion activity and peer tutor in the home group, (7) giving quiz and award and also homework in the forms of reading and creating summary related to the materials that will be studied.

RESEARCH METHODS

This was a quasi-experimental research using Nonequivalent Control Group Design. This research was conducted at STKIP Persada Khatulistiwa Sintang, Indonesia. The population of this research was all the students of biology education program with the total of 586 students. The sample of this research was the students who programmed zoology course on the even semester of the 2015/2016 academic year with the total sample of 125 students. The sample of the experiment class was taken by using simple random sampling technique based on the equality level of their academic ability. The results of the placement test indicated that all the samples had equal academic ability.

In order to evaluate critical thinking of student's critical thinking was essay test of Ennis (2001) was utilized. This test is a tool which measures testable critical thinking skill through ten general questions formulating problems, giving arguments, deducting, inducting, evaluating, and deciding and implementing. The total score of this test is one hundred and the obtained scores in each part may be variable between zero and fifteen. Validity of the test contents is approved by the related specialists. To test the reliability, we used Cronbach Alpha. The level of Cronbach Alpha obtained for this test was as high as 0.88 representing the high reliability of this test.

The procedure of the data collection was: (1) at the beginning of the semester (pretest), the students answered the essay test given by the lecturer, (2) the end of the pretest, the students were required to submit the essay test, (3) after that, the treatments were given for 10 meetings in a row consistently, (4) at the end of the semester (post-test), the students answered again the essay test similar to that before the treatment. The answers of the students' statements were given a score (scale score, 1-5) and then it was converted to a score (ranging 0-100). The data obtained were then summarized and analyzed.

The results of the prerequisite tests, both the pretest and posttest for each learning strategy showed a normal and homogeneous distribution (value: $p > 0.05$) so that it could proceed to the inferential statistical analysis. The statistical analysis was performed using analysis of variance (ANOVA) at the significance level of 5% (value: $p < 0.05$). All the statistical tests are carried out by SPSS version 16 for Windows.

RESULTS AND DISCUSSION

The results of this study are presented and discussed in details in this section. The results of the descriptive analysis (Table 2) show that the conventional learning strategy had a lower increase than that of the JiRQA learning strategy. The increase in JiRQA produced the critical thinking skill in good category. It was different from the conventional strategy that achieved less category.

Table 2. Summary of Mean Score of Critical Thinking Skill Students

Learning strategies	N	Pretest mean	Category	Posttest mean	Category	Increase (%)
JiRQA	64	41.47	Very less	70.80	Good	70,72
Conventional	61	39.51	Very less	58.83	Less	48,90

Note N = Number of students

The results of the descriptive analysis show that the increase in the critical thinking skill mean score of Biology students in all ethnics in the JiRQA learning strategy is bigger than that of the conventional learning strategy. The findings of this research were in line with the results of the research conducted by Nezami et al (2013), as well as by Valdez et al (2015) and Garcha & Kumar (2015) by implementing cooperative learning strategies could be increase in the critical thinking skill.

The summary of the results of ANOVA to the effect of JiRQA learning strategy on the critical thinking skill of biology students can be seen in Table 3.

Table 3. Results of ANOVA

Test	Group	Sum Squares	of df	Mean Square	F	Sig.
critical_pretest	Between Groups	120.567	1	120.567	1.907	.170
	Within Groups	7774.610	123	63.208		
	Total	7895.177	124			
critical_posttest	Between Groups	4478.489	1	4478.489	53.899	.000
	Within Groups	10220.086	123	83.090		
	Total	14698.575	124			

As presented in Table 3, The results pretest of ANOVA show that learning strategy did not have an effect on critical thinking skill of Biology students ($p: 0.170 > 0.05$). This results provide information that the beginning learning did not have difference the critical thinking skill on sample total. The results posttest of ANOVA (Table 4) show that learning strategy had an effect the critical thinking skill of Biology students ($p: 0.000 < 0.05$). The results posttest of ANOVA related to the learning strategy potency show that JiRQA was 21,82% higher and significantly different from the conventional learning. These results indicate that the JiRQA learning strategy is more capable to increase the critical thinking skill of Biology students than the conventional learning strategy. The higher increase of the critical thinking skill of biology students experiencing the JiRQA learning strategy is caused by the fact that this strategy has more advantages when compared to the conventional learning. The superiority of the JiRQA learning strategy cannot be separated from the syntax or stages on each learning activity combined. The stages of JiRQA strategy activity such as be an expert there, will be able to demand the students to think independently and in a group in finishing the problem given. That learning activity will enhance the students to be independent learners. Corebima (2006) explained it is clear that self regulated learning of learners is conditioned to think continuously.

JiRQA learning strategy can involve the students to do discussion both in home group and in expert group. The discussion activities in JiRQA learning will be able to give the chance to students to argue each other, ask a question, and draw the conclusion to the material discussed. Lie (2008) and Slavin (2010) denoted that the existence of discussing and arguing activity in jigsaw will bring expansion and cognitive conflict to students; as a result, the students are used to think. Furthermore, Ariyanti, et al (2013) expressed that the students who are often trained to exchange the ideas, argue, exchange the information, and solve the problem in small discussion group will create their ability to be more critical and creative.

JiRQA learning strategy will give the chance to each expert groups to present the material (tutor) to other group members that not expert (home group). Peer tutor activity enables students to exchange the information and think more. Hence, it trains students' ability in analyzing and interpreting material discussed. Sagun (2010) stated that peer tutor activity in home group is able to drill students' skill to discuss, responsible, and help each other in learning process. Therefore, peer tutor in JiRQA learning strategy can sharpen students' critical thinking.

JiRQA learning strategy also requires the students to read, make a summary, make a question, and answer their questions made. Those activities will influence to students' critical thinking skill. Hassoubah (2007) uttered if someone read critically then it will drill his/her critical thinking ability. Moreover, Sumampouw (2011) said that the reading habit can sharpen someone's critical thinking skill. Related to making the questions, Alindada's research (1988) conveyed question is the easiest way to challenge the patterns of creative and critical thinking. A same case is also express by Lubliner (2001), question is a tool which is used to improve students' critical thinking and can be achieved through stimulus from the teachers in the form of giving questions.

CONCLUSION

Based on the results of the data analysis and discussion, it can be concluded that JiRQA learning strategies had an effect of the critical thinking skill of biology students. The increase of the critical thinking skill on JiRQA learning strategies was 21,82% higher than that on the conventional strategy. Consequently, JiRQA learning strategy has been shown to empower biology students' critical thinking skill in higher education. The empowerment of critical thinking skill through JiRQA learning strategy cannot be separated from activities in stages such as forming the expert group and home group, discussion activity, reading activity, questioning, answering, and peer tutor activity. JiRQA learning strategy gives one alternative that can be used in learning process to empower students' critical thinking skill in higher education.

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