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"Improving Quality of Mathematics, Science and Computer Science Education Through Research"

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"Improving Quality of Mathematics, Science and Computer Science Education Through Research"

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PREFACE

We are pleased to welcome all of the participants to Second International Seminar on Mathematics, Science and Computer Science Education (MSCEIS 2015). MSCEIS 2015 is organized by Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam Universitas Pendidikan Indonesia (FPMIPA UPI), in collaboration with:

- Program Studi IPA Sekolah Pascasarjana UPI (Science Education Graduates Program)
- University of Tasmania
- National Taiwan Normal University

MSCEIS has been started since 2013 as an International Seminar of Mathematics, Science and Computer Science Education. This seminar is motivated by improving the quality of mathematics, science and computer science education. The aims of the seminar are: (1) To bring together the scientists, education experts and practitioners, students, and civil society organization representatives in the scientific forum; (2) To share and to discuss theoretical and practical knowledge about innovation in mathematics, science and education.

MSCEIS will be held every year to provide forum for researchers in Mathematics, Science and Computer Science Education to share new ideas or research result in their field. The theme for this seminar is "Improving the Quality of Mathematics, Science and Computer Science Education through Research". This seminar is sponsored by FPMIPA UPI.

The scope of research results to be presented and discussed in this seminar covers Pure and Applied Mathematics, Science and Technology, Information and Technology, Mathematics, Science and Computer Science Education.

The MSCEIS 2015 Program features 13 invited speakers and 380 contributed oral presentations, which come from different countries: Taiwan, Australia, USA and Indonesia. All papers reviewed before and after they are presented in this event. Selected papers will be published in the American Institute of Physics (AIP) Conference Proceedings series.

To all participants, we hope that you will learn new subjects, make new contacts, and have fruitful discussions with others. To overseas participants, we wish you a pleasant stay in Bandung.

Finally, we wish to express our sincere appreciation to all of the presenters for their valuable contributions and also to the members of the program committee for their excellent works in selecting abstracts and organizing the program.

October, 2015

MSCEIS 2015 Committee



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BIO-05420

The Analysis Of Critical Thinking Skill Students In Science Lessons

Baiq Fatmawati

Program Studi Pendidikan Biologi, STKIP Hamzanwadi - Selong

Article info	Abstract
Keywords: higher order tihinking skill, critical thinking, science, gender Corresponding Author: f_baiq@yahoo.com	To Improving the quality of science education was done through thinking of science and development thinking science, because it can to increase high order thinking skills students. The Critical thinking is one of part high order thinking skills; the critical thinking is meant corrected thinking in search for relevant and reliable knowledge about the world of reality. The Critical thinking is a mental activity in terms of problem solving, making decisions, analyzing assumptions, evaluating, giving rational, and conducts an investigation. The Critical thinking meant as correct thinking in the search for relevant and reliable knowledge about the world of reality because one of the goals of learning critical thinking in the teaching of science is to improve students thinking skills and also prepare students to face the challenges of everyday life. This research was focused to analysis of critical thinking skills students in junior high achoel. The participant are students of the junior scheel (N=80). Data
	was collected using critical thinking test which consists of eight questions. The Result of analysis shown the percentage of critical thinking skills in each indicator are: 1) Elementary clarification 62%; 2) Basic support 43.5%; 3) Inference 43.8%; 4) strategies and tactic 13%; 5) a further explanation of 20.6%. If refer to frombased on gender, male and female student have almost same score in each indicator, Mean of critical thinking skills in each indicator for male student are: (1) Elementary clarification 1.5; (2) Basic support 0.9; (3) Inference 1.1; (4) strategies and tactic 0.4; (5) a further explanation 0.5.and female student are: 1) Elementary clarification 1.5; (2) Basic support 1.1; (3) Inference 0.9; (4) strategies and tactic 0.2; (5) a further explanation 0.5., it's meant both can answers the question critical thinking in science lessons.

INTRODUCTION

The current curriculum requires developing higher order thinking skills students. Higher order thinking skills is a cognitive operation that is much needed in the thinking processes that occur in the short-termmemory. Higher Order Thinking Skills defined including critical thinking, logical thinking, reflective, metacognition andcreative (King., *et. al.*, 2011). All these skills will be active when a person is faced with an unusual problem, uncertainty, questions and choices. Costa (1985) stated that there are four groups of higher order thinking skills processes such as: problem solving, decision making, critical thinking, and creative thinking.

Teaching higher order thinking skills one of the objectives in all levels of education as junior high school, senior high school and the university. In fact, several of junior high schools in Lombok Timur, rarely to train of higher order thinking skills; the assumption is teachers have not known the technique to teach that ability. Tests given still limited in the low cognitive level and students disposed less actively engaged in learning process that involves the ability to think, students are listening to the explanation of the teacher. That condition causes the achievement of learning outcomes still low, especially





the cognitive learning. According Mahanal&Zubaidah (2009: 48),the learning process each level in education should focused on developing student's critical thinking.

The resultsof Computertechnology Research (CTR) showed the person only remember 20% what he had seen 30% of hearing, 50% both are heard and seen, and 80% is heard, seen and doing simultaneously (Raniawaty, 2011). In addition, Levie and Levie (Arzad, 2009) conclude that the visual stimulus produced better learning outcomes for tasks such as remembering, recognizing, recalling, and the connection between the facts and concepts. Meanwhile the stimulus verbal give better learning outcomes when the learning involves sequentially memory.

Natural Sciences is one of the subjects at the junior school level, the concept about natural and have a relationship is very widely associated with human real life.Natural Sciences as knowledge gained through data collection with experimentation, observation and deduction to produce an explanation of symptoms that can be trusted.Natural Sciences developed as an *integrative science* subjects rather than as disciplines educational, applicative oriented, the development of thinking skills, ability to learn, curiosity, and the development of caring and responsible attitude towards the social and natural environment. Natural Sciences also devoted to introduction of biology environmental, natural surroundingsand introduction a variety advantages over the archipelago (Kemdikbud, 2013).

The establishment of the conceptual system in Natural Sciences, a higher order thinking skillsprocesses commonly used is critical thinking. In this case, it is necessary to have the society who understand the concept and the principles of science, who live harmonically with the nature, who recognize the variety of the nature, who apply the knowledge and the way of thinking on science for the social and individual purpose, and who give a priority to the science competency which is needed by all members of society in order that it is beneficial to cope the problems in daily lives (Rutherford &Ahlgren, 1990). In teach science concept,teachers rarely apply to training students' of higherorder thinking skillsespecially critical thinking skills, whereas critical thinking can be applied in the contextual content, and form assessmentused still a classic type that is multiple choice questions and essay type more require student's ability to memorize and remembering.Based on described in background, the question of research is whether students can be critical thinking using essay questionson science subjects?

EXPERIMENTAL METHODS

This research used by descriptive statistics that is described toward researched object through the sample data or population without analysis and making a conclusion for generally (Sugiyono, 2011). The participant is junior high school student (N=80). To assessment critical thinking skills students' used the form essay questions with referable of critical thinking skills indicator stated by Ennis i.e., 1) Elementary clarification; 2) Basic support; 3) Inference; 4) Strategies and tactic; and 5) a further explanation(Komalasari, 2011). Analysis data by calculating percentage and mean for each critical thinking skills indicator.

RESULTS AND DISCUSSION

A learning activities in Natural Sciences include developskills to asking questions, to finding answers, to understand answers, to complete answers about "what", "why" and "how" of natural phenomena and characteristics in their around through systematically





many ways will be applied in the environment and technology. Three ability in Natural Sciences that are: (1) ability to know what observed, (2) ability to predictions what has not been observed, and to examine the follow-up results of the experiment, and (3) development of a scientific attitude. Critical thinking has impact for student to analyze and solve the information thatfounded. Here are the results of critical thinking skills students' be presented in form chart (see Figure 1).



Figure 1. Persentage and Mean of Critical Thinking Skills Student

The questions about concept of science (global warming content) was given to junior high school students (grade 7), the question referableof critical thinking skills indicator.Based on analysis data, its appears that the indicator Elementary clarification get more percentage (62%) compared with other indicators, this causesbecause the questions isrequire answers by stated the simple reason based on theory their obtained, as an example the question "Why deforestation can be one of the causes of global warming" and the answer have in their book.According Zubaidah (Mahanal, 2009), the better quality of the questions asked it is increasingly clear show used good reasoning.However, the use of language teachers in accordance with the age of students is an important consideration in teaching (Dahar, 2006).

In this research, researcher try to expressed defferent thinking skills of male and female students, and the result is almost in each indicator have same a result, just different two point (male 4,4 and female student 4,2). A details of result in each indicator if see from averagely: for male student are: (1) Elementary clarification 1.5; (2) Basic support 0.9; (3) Inference 1.1; (4) strategies and tactic 0.4; (5) a further explanation 0.5.and Female student are: 1) Elementary clarification 1.5; (2) Basic support 1.1; (3) Inference 0.9; (4) strategies and tactic 0.2; (5) a further explanation 0.5.(see Figure 2).Facione (Quitadamo and Kurzt, 2007) stated that critical thinking is a process in assessing self-regulation, solve the problems, and make decisions.Critical thinking is a destination, the process of self-regulation that provides a mechanism to solve problems and make decisions based on logical reasoning which is very useful in solving national and global issues.The critical thinkingskills is examining,connecting evaluating aspects on the problem, collected





and organized information, validating and analyzing information. Included also remember and associate information previously learned, determine a rational answer, discribed valid conclusions, analysis and reflection.Ennis (Marzano, 1988) stated, critical thinking as a reasonable reflective thinking focused on the decision to be sure and do that is a form of creative action.



Figure 2. Mean of Critical Thinking Skills Based On Gender

Science learning has a roleto arouse interest someone to understand about universe and can be applied in real life. One of basic assumptions in standardization in science education is the learning of science tended of learners needed, involved in the learning process and being able to learn science (NRC, 1996).By learning science, students can logically thinkingand training the higher order thinking skills. The Science education can help learners to develop an understanding and habits of thinking for himself and his nation (Liliasari, 2011).According Presseisen (Costa, 1985) thinking is a process of mental activity an individual to get knowledge. This process is a conscious cognitive activity and pursued resulting in the acquisition of meaningful knowledge. Costa added that thinking is receiving external stimuli through the senses and internally processed, if the information is saved, the brain will paired, compared it, categorized, and shaped be the same information that has been saved.





CONCLUSION

A students in junior high school grade 7 can critical thinking in science lessons, and male and female student too. The form question to measure higher order thinking skills studentsespecially critical thinking is essay type and contextual content. Learning science helps students to logically thinking and training higher order thinking skills especially critical thinking skills. Thepercentage critical thinking skills students' in science lesson for each indicator are: 1) Elementary clarification 62%; 2) Basic support 43.5%; 3) Inference 43.8%; 4) strategies and tactic 13%; 5) a further explanation 20.6%. Mean of critical thinking skills ineach indicator for male and female students: a) male studentare: (1) Elementary clarification 1.5; (2) Basic support 0.9; (3) Inference 1.1; (4) strategies and tactic 0.4; (5) a further explanation 0.5. and (b) Female student are: 1) Elementary clarification 1.5; (2) Basic support 1.1; (3) Inference 0.9; (4) strategies and tactic 0.2; (5) a further explanation 0.5.

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