Proceeding
International Seminar on Mathematics, Science, and Computer Science Education


“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
# TABLE OF CONTENT

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preface</td>
<td>i</td>
</tr>
<tr>
<td></td>
<td>Table of Content</td>
<td>ii</td>
</tr>
<tr>
<td></td>
<td>The Committee</td>
<td>iii</td>
</tr>
<tr>
<td></td>
<td>Schedule of Program</td>
<td>vi</td>
</tr>
<tr>
<td>Section 1</td>
<td>Mathematics and Mathematics Education</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>List of Article Mathematics Education</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>List of Papers Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Section 2</td>
<td>Physics and Physics Education</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td>List of Papers Physics &amp; Physics Education</td>
<td>201</td>
</tr>
<tr>
<td>Section 3</td>
<td>Chemistry and Chemistry Education</td>
<td>419</td>
</tr>
<tr>
<td></td>
<td>List of Papers Chemistry &amp; Chemistry Education</td>
<td>419</td>
</tr>
<tr>
<td>Section 4</td>
<td>Biology and Biology Education</td>
<td>512</td>
</tr>
<tr>
<td></td>
<td>List of Papers Biology Education</td>
<td>512</td>
</tr>
<tr>
<td></td>
<td>List of Papers Biology</td>
<td>514</td>
</tr>
<tr>
<td>Section 5</td>
<td>Science Education</td>
<td>714</td>
</tr>
<tr>
<td></td>
<td>List of Papers Science Education</td>
<td>714</td>
</tr>
<tr>
<td>Section 6</td>
<td>Computer Science and Computer Science Education</td>
<td>955</td>
</tr>
<tr>
<td></td>
<td>List of Papers Computer Science Education</td>
<td>955</td>
</tr>
<tr>
<td></td>
<td>List of Papers Computer Science</td>
<td>955</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO-05019</td>
<td>THE INFLUENCE OF THE CONCEPT MAP OF WIMBA LEARNING MODEL IN PLANT ANATOMY FOR INCREASE THE RESULT LEARNING OF BIOLOGY STUDENTS TEACHERS</td>
<td>B-516</td>
</tr>
<tr>
<td>BIO-05022</td>
<td>THE USAGE OF INTERACTIVE MULTIMEDIA SIMULATION MODEL TO INCREASE THE STUDENTS ANALYSIS SKILL IN STKIP AT GARUT (QUASI EXPERIMENTAL TEACHING OF ANIMAL PHYSIOLOGY THE BIOLOGY EDUCATION COURSES AT STKIP GARUT)</td>
<td>B-522</td>
</tr>
<tr>
<td>BIO-05023</td>
<td>BUILDING HABITS OF MIND AND ABILITY THINKS STUDENTS VIA PRACTICUM</td>
<td>B-528</td>
</tr>
<tr>
<td>BIO-05043</td>
<td>DEVELOPMENT OF INFORMAL REASONING REGARDING SOCIO-SCIENTIFIC ISSUES AT THE ELEMENTARY SCHOOL, JUNIOR HIGH SCHOOL, AND SENIOR HIGH SCHOOL</td>
<td>B-532</td>
</tr>
<tr>
<td>BIO-05047</td>
<td>THE IMPLEMENTATION OF INSERVICE TRAINING-BASED LESSON STUDY (INSTALS) TO IMPROVE BIOLOGY TEACHERS’ HANDS ON ABILITIES</td>
<td>B-537</td>
</tr>
<tr>
<td>BIO-05049</td>
<td>LEARNING VERTEBRATE ZOOLOGY TAXONOMY THROUGH APPROACH ETHNOZOOLOGY PROJECT IN GARUT</td>
<td>B-544</td>
</tr>
<tr>
<td>BIO-05051</td>
<td>DEVELOPMENT OF THE COMPLEXITY OF STUDENT’S ARGUMENTATION ON SOCIO-SCIENTIFIC ISSUE</td>
<td>B-551</td>
</tr>
<tr>
<td>BIO-05055</td>
<td>STUDENT ETHICAL REASONING DEVELOPMENT IN LEVEL EDUCATION ELEMENTARY SCHOOL (ES), JUNIOR HIGH SCHOOL (JHS) AND SENIOR HIGH SCHOOL (SHS) ABOUT SOCIO-SCIENTIFIC ISSUES</td>
<td>B-558</td>
</tr>
<tr>
<td>BIO-05058</td>
<td>STUDENTS’ SCIENTIFIC REASONING ABOUT GLOBAL WARMING</td>
<td>B-567</td>
</tr>
<tr>
<td>BIO-05104</td>
<td>STUDENT’S METACOGNITIVE AWARENESS IN</td>
<td>B-573</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>BIO-05420</td>
<td>THE ANALYSIS OF CRITICAL THINKING SKILL STUDENTS IN SCIENCE LESSONS</td>
<td>B-641</td>
</tr>
<tr>
<td></td>
<td>Baiq Fatmawati</td>
<td></td>
</tr>
<tr>
<td>BIO-05422</td>
<td>IMPLEMENTATION OF SCIENCE PROCESS SKILL BASED INSTRUCTION ON BIODIVERSITY USING LOCAL POTENCY TO IMPROVE CLASSIFICATION ABILITY OF JUNIOR HIGH SCHOOL STUDENTS</td>
<td>B-647</td>
</tr>
<tr>
<td></td>
<td>Hasna Nuraeni, Nuryani Y. Rustaman, Suroso Adi Yudianto</td>
<td></td>
</tr>
<tr>
<td>BIO-05436</td>
<td>DEVELOPMENT OF ANTHROPOCENTRIC, BIOCENTRIC, ANDECOCENTRIC IN ELEMENTARY SCHOOL, JUNIOR HIGH SCHOOL, AND SENIOR HIGH SCHOOL ABOUT ENVIRONMENTAL ISSUES</td>
<td>B-655</td>
</tr>
<tr>
<td></td>
<td>Luthfianti Zhafarina Harmany, Ari Widodo, Riandi</td>
<td></td>
</tr>
<tr>
<td>BIO-05440</td>
<td>THE EFFECT OF APPLICATION OF LEARNING CYCLE 5E OF CONCEPTUAL CHANGES HIGH SCHOOL STUDENT ON THE CONCEPT OF COORDINATION SYSTEM Maftuhah, Taufik Rahman</td>
<td>B-663</td>
</tr>
<tr>
<td>BIO-05442</td>
<td>ANALYSIS OF STUDENTS’ UNDERSTANDING OF BLOOD CIRCULATION SYSTEM IN ELEMENTARY SCHOOL, JUNIOR HIGH SCHOOL, AND SENIOR HIGH SCHOOL</td>
<td>B-669</td>
</tr>
<tr>
<td></td>
<td>Mentari Qorina Alwasilah</td>
<td></td>
</tr>
<tr>
<td>BIO-05450</td>
<td>THE ROLES OF FORMATIVE ASSESSMENT IN DEVELOPING BIOLOGY STUDENT’S HABITS OF MIND</td>
<td>B-675</td>
</tr>
<tr>
<td></td>
<td>Siti Sriyati</td>
<td></td>
</tr>
<tr>
<td>BIO-05506</td>
<td>THE DEVELOPMENT OF GENETIK AS AN INTEGRATED TECHNOLOGY, PEDAGOGY AND CONTENT KNOWLEDGE (TPACK) ON GENETIC COURSE FOR BIOLOGY EDUCATION STUDENT</td>
<td>B-685</td>
</tr>
<tr>
<td></td>
<td>Riandi</td>
<td></td>
</tr>
</tbody>
</table>

### BIOLOGY

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO-06024</td>
<td>THE CONTENT OF CHLOROPHYLL, CHROMIUM AND ENZYME ACTIVITY OF CATALASE (CAT) AND ASCORBATE PEROXIDASE (APX) ON BANANA PLANTLETS (MUSA PARADISIACA) CV. NANGKA IN CHROMIUM STRESS CONDITION</td>
<td>B-693</td>
</tr>
<tr>
<td></td>
<td>Lida Amalia, Taufikurahman and Sri Nanan B. Widiyanto</td>
<td></td>
</tr>
<tr>
<td>BIO-06084</td>
<td>ECTOPARASITES IDENTIFICATION ON CHICKEN IN DESA BOJONGSALAM KECAMATAN RANCAEKEK KABUPATEN</td>
<td>B-699</td>
</tr>
</tbody>
</table>
The Analysis Of Critical Thinking Skill Students In Science Lessons

Baiq Fatmawati

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Article info
Keywords:
higher order thinking skill, critical thinking, science, gender

Abstract
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 school. The participant are students of the junior school (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 from based 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-term memory. Higher Order Thinking Skills defined including critical thinking, logical thinking, reflective, metacognition and creative (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 is 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 be focused on developing students’ critical thinking.

The results of Computer Technology Research (CTR) showed the person only remember 20% of what he had seen, 30% of what he had heard, 50% both are heard and seen, and 80% is heard, seen and doing simultaneously (Raniawaty, 2011). In addition, Leevie and Leevie (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 surroundings and introduction a variety advantages over the archipelago (Kemdikbud, 2013).

The establishment of the conceptual system in Natural Sciences, a higher order thinking skills processes 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 higher order thinking skills especially critical thinking skills, whereas critical thinking can be applied in the contextual content, and form assessment used 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 questions on 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 developing skills 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 that founded. Here are the results of critical thinking skills students' be presented in form chart (see Figure 1).

**Figure 1. Percentage 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 referable of critical thinking skills indicator. Based on analysis data, it appears that the indicator Elementary clarification get more percentage (62%) compared with other indicators, this causes because the questions require 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 different 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 thinking skills is examining, connecting and 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, described 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](image)

Science learning has a role to 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 thinking and 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 students especially 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. The percentage 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 in each indicator for male and female students: a) 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 (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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REFERENCES
