Analysis of Students’ Critical Thinking Skills at Junior High School in Science Learning

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Abstract. Critical thinking skills is one of students’ skills needed to face globalization in 21st century challenge. Critical thinking skills are active processes to thinking deeply due to topic or materials through meaningful way. The indicators of critical thinking skills are thinking about certain topic in depth, asking questions, and finding relevant information. This study aimed to analyze students’ critical thinking skills at junior high school in science learning. Instruments used in this study were created according to Facione indicators of critical thinking skills namely to interpret, to analyze, to evaluate, to infer, to explain, and to do self-control. Subjects in this study were 256 students of seventh grade at junior high school in Karanganyar. Purposive sampling were used as sampling technique. Results showed that two indicators have gained good category namely to analyze that was 62% and to evaluate that was 70%; while four other indicators have gained sufficient category namely to interpret that was 35%, to infer that was 49%, to explain that was 40%, and to do self-control that was 46%. The conclusion of this study was there were two indicators of students’ critical thinking skills gained good category and four indicators of students’ critical thinking skills gained sufficient category. Thus proper follow-up of this study is needed to explore ways to improve the achievements of each indicators in students’ critical thinking skills.

1. Introduction
The development of the 21st century has brought an advanced technology by encouraging various fields including education [1]. In 21st century, human resources began to be replaced by technology. The era of the 21st century has become easier because of technology [2]. Technological developments encourage humans to change their habits so that it can be said that humans cannot live without the existence of technology. Technology can help people in communication, transportation, and education [3]. The 21st century learning has been accepted and has become a focus on several skills that must be mastered by students. Students in the 21st century must have new learning goals through different and new teaching [4]. The intended learning goal is to improve the skills needed in the 21st century. Throughout history, critical thinking and problem solving skills are the main components of human development [5]. The 21st century skills represent characteristics that students should have to overcome difficulties and achieve success [6].

The 21st century learning is firstly characterized by encouragement to students in finding knowledge out of information sources. Second, learning is directed at formulating problems. Third, learning trains students in making decisions. Fourth, the 21st century learning emphasizes collaboration in problem solving [7]. The 21st century learning focuses on four skills (4C) that must be mastered by students namely communication, critical thinking, collaboration, and creativity. One of the most important things in facing the 21st century era is critical thinking skills. Critical thinking skills are active processes to thinking deeply due to topic or materials through meaningful way. The
indicators of critical thinking skills are thinking about certain topic in depth, asking questions, and finding relevant information [8]. Critical thinking skills include: 1) actively looking for all sides of the argument, 2) testing the strength of claims made, and 3) testing the strength of the evidence used to support the claims. Critical thinking helps in creating strong arguments [9]. Students who are active in learning can train their scientific reasoning in developing critical thinking skills [10]. Based on this background, this study aims to analyze students’ critical thinking skills at junior high school in science learning.

2. Research Method

Instruments used in this study were created according to Facione indicators of critical thinking skills namely to interpret, to analyze, to evaluate, to infer, to explain, and to do self-control. Subjects in this study were 256 students of seventh grade at junior high school in Karanganyar. Purposive sampling were used as sampling technique. Data were collected from students’ answer toward questions using evaluation rubric that has been validated.

3. Results and Discussion

Critical thinking processes can improve activities in identifying problems, investigating data, discussing findings, evaluating findings, making solutions, presenting solutions, and presenting learning outcomes [11]. Results showed that two indicators have gained good category namely to analyze that was 62% and to evaluate that was 70%; while four other indicators have gained enough category namely to interpret that was 35%, to infer that was 49%, to explain that was 40%, and to do self-control that was 46%. Results of students’ critical thinking skills per indicators in percentage were shown in Figure 1.

![Figure 1. Results of Indicators in Students’ Critical Thinking Skills](image)

The best percentage result of indicator in critical thinking skills is to evaluate with a percentage of 70%. To evaluate is an indicator including commenting on successes and failures of something, or evaluating something [12]. Evaluation activities that have been mastered by students can be presentation skills, performance evaluation, and applying knowledge about product making, synthesizing information, and giving reasons based on former knowledge and information [13]. Evaluation can also be in the form of interpreting statements about the description / experience of analytical activities [14]. Evaluation activities can be used to make judgments about information [15].

Another indicator that is classified as good is to analyze with a percentage of 62%. This indicates that students can analyze evidence and facts that differentiate from presumptions [16]. Analysis, synthesis, and evaluation are the results associated with critical thinking activities, seeking knowledge, understanding, and application [17]. The next indicator which is classified as sufficient is to infer with a percentage of 49%. This indicates that students have not been maximal in inferring their findings. To infer is the ability to use two or more information from a text to arrive at the third information implied
4. Conclusion
Results of each indicators were different and unique from one to another. Results showed that two indicators have gained good category namely to analyze that was 62% and to evaluate that was 70%; while four other indicators have gained sufficient category namely to interpret that was 35%, to infer that was 49%, to explain that was 40%, and to do self-control that was 46%. The conclusion of this study was there were two indicators of students’ critical thinking skills gained good category and four indicators of students’ critical thinking skills gained sufficient category. Thus proper follow-up of this study is needed to explore ways to improve the achievements of each indicators in students’ critical thinking skills.

References
[1] Amornkitpinyo T and Wannapiroon P 2015 Proc. Soc. and Behav. Scie. 174 2091
[2] Hidayah R, Salimi M, and Susiani T S 2017 J. Tam. Cend. 1 127
[3] Fatimah A S and Santiana 2017 J. Ling. and Eng. Teach. 2 126
[4] Mishra P and Mehta R 2017 J. Dig. Learn. Teach. Educ. 33 7
[5] Boyaci S and Atalay N 2016 Inter. J. Instruc. 9 134
[6] Ball A, Joyce H D and Butcher D A 2016 Inter. J. Sch. Soc. Work 1 2
[7] Wijaya E Y, Sudjamit D A, Nyoto A 2016 Pros. Sem. Nas. Pend. Mat. 1 266
[8] Fisher A 2014 Berpikir Kritis: Sebuah Pengantar (Jakarta: Erlangga)
[9] The Open University 2008 Skills for OU Study Thinking Critically (London: Thanet Press)
[10] Nichols M, Cator K and Torres M 2016 Challenge Based Learner User Guide (California: Digital Promise)
[11] Changwong K, Sukkamart A, and Sisan B 2018 J. Int Studies 11 45
[12] University of Leeds. (n/d). Understanding critical thinking
[13] Sumarni W, Supardi K I, Widiarti N 2018 Conf. Ser.: Mater. Sci. Eng. p 2
[14] Facione P A 2015 *Critical Thinking: A Statement of Expert Concensus for Purpose of Educational Assessment and Instruction* (Newark: American Philosophical Association)

[15] Bloom B S 1956 *Taxonomy of Educational Objectives. Handbook 1, Cognitive Domain* (London: Longman)

[16] Belecina R R and Ocampo J M 2018 *Int. J. Educ. Stud.* 10 112

[17] Styron R A 2014 *Systemics, Cybernetics, and Informatics.* 12 26

[18] Kispal A 2008 *Effective teaching of inference skills for reading: Literature review* (National Foundation for Educational Research)

[19] Rumainah 2018 *Ta’dib: J. of Islam. Educ.* 23 61

[20] Ennis R H 1985 *Critical Thinking* (Urbana: University of Illinois)

[21] Piaw C Y 2004 *Creative and Critical Thinking Styles* (Malaysia: Universiti Putra Malaysia)

[22] Thomas T 2011 *Asian Soc. Scie.* 7 30

[23] Eggen P and Kauchak D 2012 *Strategi dan Model Pembelajaran Mengajarkan Konten dan Keterampilan Berpikir Edisi Keenam* (translated by Satrio Wahono) (Jakarta: Indeks)

[24] Damanik D P and Bukit N 2013 *J. Pend. Fis.* 2 24