

CHAPTER I

INTRODUCTION

A. Background

Nowadays, almost everything in our daily life are integrated with technology start from wake up in the morning until staying up late in the night watching TV or browsing the internet. But we have to also realize that the technology also integrates to the education system in details such as the uses of computer and media in the educational administration on the pedagogy that currently become global natural trend of modernization (Tzu, 2012). This research focusing on the computer-based test or also can referred as computer-based Assessment that is more enhanced as a Virtual Test. Computer itself has bring our civilization into a states where technology becomes the world addiction but also crucial needs (Chand et al., 2014). Furthermore, in educational issue it is often found out that the educational system also reformed into technological-system that integrated with technology almost in all aspects, especially computer processing that also becomes crucial and compulsory needs in our educational system (Sar, Tuncay & Horzum, 2015). The interest in development and usage of computer-based test in educational assessment in schools and other educational institutions has increased in recent past years (Valenti, Cuchiarelli, & Panti, 2002). Executing assessments by using computer in the process is becoming more prevalent in educational assessment as changes are made in assessment methods that reflect changes in pedagogical systems (Tzu, 2012).

Paper-based Test itself is a very conventional test which commonly implemented in our educational system in recent years of country educational development that require more cost, time, and more efforts to assess especially if it done in a large scale (Csapó, Molnár & Nagy, 2014). According to DeRosa (2007), reducing paper consumption will indirectly reduce greenhouse gases and energy consumption that 40 reams of paper are equal to 1.5 acres of pine forest absorbing

carbon for a year and each ream of paper is equal to roughly 12 pounds of carbon dioxide not removed from the atmosphere. Meanwhile, Computer-based testing or

computer-based assessment is a green strategy used to reduce paper consumption that tons of paper would be saved if schools, universities and educational institutions were to replace paper-pencil testing with computer-based testing (Piaw, 2012).

Computer-based test or computer-based assessment is a very convenient method. Moreover, it increases the transparency and speed of marking and students develops their creativity as well as their capacity of thinking (Arachchi, Dias, & Madayanake, 2014). For instance, a research revealed that students prefer to be more enjoyed the computer-based test more than the paper-based test and they were more motivated to perform computer-based test repentance than another paper-based test (Haahr & Hansen, 2006). Testing motivation in past research was reported to be negatively associated with testing time, and test takers positively preferred computer-based test for focusing attention, enjoyment and self- efficacy (Morgan & O'reilly, 2001; Boo, 1997). Moreover, recent researches also show vast advantages for the students as well as for the lecturers (Arachchi, Dias, & Madayanake, 2014).

Critical thinking is a learned skill (Halpern, 1998). According to Ennis (1989) Critical thinking is the practice of processing this information in the most skillful accurate, and rigorous manner possible, in such a way that it leads to the most reliable logical, and trustworthy conclusions, upon which a person can make responsible decision about life, behavior, and actions with full knowledge of assumptions and consequences of those decisions. Critical thinking is basically a form of thinking used in problem solving scenarios and uses knowledge acquired over a lifetime in a manner that is logical. This form of thinking demonstrates the skills dimension of critical thinking (Facione, 2000). Critical thinking involves “purposeful, goal-directed” thinking in a process of making decisions based on evidence rather than guessing in a scientific problem-solving process (Nugent and Vitale, 2008). It involves logical reasoning, an ability to separate facts from opinions, examining things before accepting them, and asking oneself questions all the time (Wood, 2002). Furthermore, the process of formal

reasoning in itself includes some processes. Nugent and Vitale (2008) explain some of the processes of formal reasoning which incorporate critical thinking which is; problem solving, decision making, diagnostic reasoning, and scientific method.

Computers and electronic technology today offer myriad ways to enrich educational assessment both in the classroom and in large-scale testing situations (Scheuermann & Bjornsson, 2009). With dynamic visuals, sound and user interactivity as well as adaptivity to individual test-takers and near real-time score reporting, computer-based assessment vastly expands testing possibilities beyond the limitations of traditional paper-and-pencil tests (Scalise & Gifford, 2006). Thus we could see that computer giving more eligible environment to assess critical thinking of the students. Students' are has their own capabilities with their own uniqueness and abilities. Schools often measure their capabilities by measuring their intelligences by the test that are equal for all the students regarding their intelligence capabilities (Hajhashemi & Eng, 2010). But in reality students is believed to have various abilities that cannot only measured by the test of the schools exam (Chan, 2006; Karolyi, Ramos-Ford & Gardner, 2003). Then Gardner (1983) really disagree with that system that makes students limited only the printed test that measure their school experience and believed that every person can has more multiple capabilities without ignoring another their weakness. This argument are strongly supported by Armstrong (2009) which describe that students are gifted with Multiple Intelligences that can be used to support the teaching learning process and also to support their development as learner and human in social life. So regarding to their explanations author believe that intelligences is unique and relates to critical thinking.

Computer-based test, as well as developed as virtual test, can assess students' critical thinking, that makes students' become human for their decisions on their life, not only intelligence that is burden their mind. Every peculiarities of students' intelligences as it mention as Multiple Intelligence also be considered that it is believed that every students gifted not only a single ability that is represented as score. In fact, a lot of research works have been conducted to evaluate the

comparability of computer-based assessment and paper and pencil based assessment. Some studies revealed that there is a significant difference between the two testing modes on test scores (e.g. Scheuermann & Björnsson, 2009; Choi, Kim, & Boo, 2003), while other studies reported opposite or inconsistent results (e.g. Al-Amri, 2009). This may lead into a sign that a further research is need to be done to make it clear about computer and paper-based assessment that in this case the research used science virtual test as an innovative computer-based assessment.

With all the information provided, hereby, author encouraged to do the research with title “The Comparison between Science Virtual and Paper-Based Test in Measuring Grade 7 Students’ Critical Thinking” that is analyzed based on Multiple Intelligences, gender and others additional information. It is assumed that Science Virtual Test is one kind of a test that provides advantages beyond the limitation of paper-based test and becoming more eligible ways to measure students’ critical thinking.

B. Research Problem

The research problem of this study is “How is the comparison between Science Virtual and Paper-based Test in Measuring grade 7 student’s critical thinking?”

C. Research Question

Regarding the research problem, this research attempt to explore these following questions:

1. How is the comparison between science virtual and paper-based test based on the tests’ score?
2. How is the comparison between science virtual and paper-based test based on the test items’ type?
3. How is the comparison between science virtual and paper-based test based on critical thinking elements’ score?
4. How is the comparison between science virtual and paper-based tests’ score based on students’ Multiple Intelligences?

5. How is the comparison between science virtual and paper-based test on students' critical thinking elements' score based on students' Multiple Intelligences?
6. How is the comparison between science virtual and paper-based tests' score based on gender?
7. How is the comparison between science virtual and paper-based test on critical thinking elements' score based on gender?
8. How is the students' attitude towards Science Virtual Test?
9. How is the teachers' perspectives on computer, Science Virtual and paper-based test?

D. Limitation of Problem

In order to make the research become more focused, the problem is limited as follow:

1. The Science Virtual Test used on this research made based on eight elements of critical thinking by Inch (2006). Science Virtual Test in this research also already developed by the research done by Maulida, Firman and Rusyati (2017). Furthermore, The Science Virtual Test consist of multiple choice test items where several multimedia forms included such as video, picture, chart, audio-narrative, and graph that is provided virtually within the test and constructed using Adobe flash player 9 software. Then, the implementation of Science Virtual Test is using a projector and one laptop and a speaker in the class, and each student has to fill their answer on paper provided.
2. The Paper-based Test used on this research obtained by converting the Science Virtual Test into paper-text printed format. The items are validated through some steps and expert judgment. This is conducted to maintain the equality of the research instruments between Science Virtual Test and paper-based test.
3. Critical Thinking is measured according the Inch (2006) that elaborate on eights element of critical thinking which are; purpose, question at issue, assumption, point of view, information, concepts, interpretation and conference, implication

and consequences. These elements integrated into the test items within both test modes.

4. Science content that is used in this research are limited by Core Competence no. 3 and 4 with Basic Competence No. 5 on 7th grade Science subject on *Kurikulum 2013*. These topic are simplify into theme “Living Things and Environmental Sustainability” that will be described more detail on Chapter II.
5. Multiple Intelligence is referred to the theory of Multiple Intelligences originally defined by Gardner (2011) that divide the Intelligences into nine comprehensive categories which are: Linguistic, Logical, Spatial, Bodily Kinesthetic, Musical, Naturalist, Interpersonal, Intrapersonal, and existential.
6. Gender classification used in this research is consist of male and female group.
7. Students’ attitude which is mean on this research is according to the students respond on some aspects which are: experience, preference, technical, and media. Students’ attitude on this research interpreted into two general conclusion which is positive or negative attitude using four scale Likert questionnaire.
8. Teacher perspectives on this research is refer to teacher perspectives on the implementation of computer-based, Science Virtual, and paper-based tests on schools.

E. Research Objective

This research objectives are specified as follows:

1. To investigate the comparison between Science Virtual and Paper-based Test based on the tests’ score.
2. To investigate the comparison between science virtual and paper-based test based on the test items’ type.
3. To investigate the comparison between Science Virtual and Paper-based Test based on critical thinking elements’ score.
4. To investigate the comparison between Science Virtual and Paper-Based Tests’ score based on students’ Multiple Intelligences.

5. To investigate the comparison between science virtual and paper-based test on critical thinking elements' score based on students' Multiple Intelligences.
6. To investigate the comparison between science virtual and paper-based tests' score based on gender.
7. To investigate the comparison between science virtual and paper-based test on critical thinking elements' score based on gender.
8. To investigate the students' attitude towards science virtual test.
9. To investigate the teachers' perspectives towards Computer, Science Virtual and Paper-Based Test.

F. Research Significance

The results of this study are expected to provide these following significances:

1. Teacher

The usage of evaluation is a must for teacher. This research hopefully can give some consideration of better development on an assessment to be implemented in school. This research also expected to enhance the teacher's strategy for planning an assessment on science.

2. Students

Students will get more appropriate assessment on science where the stress of completing the assessment is less. Also their critical thinking will develop rather than having a stress time on having a test. Students will also more motivated and attracted on science. The data about Multiple Intelligence can also be used to more understand about the students' ability and uniqueness in class then adapt the instruction to makes it more effective and more acceptable for students.

3. School

On the school level, school can use this information to develop the educational school system on science assessment. Especially if the school has some vision on implementing technological development for their school system.

4. Government

The result of this research could also become consideration of the development of science assessment of government policy of education especially for the national standard curriculum and pedagogy development.

5. Another Researcher

In the future, this research provides the data completeness in the implementation of Science Virtual Test on 7th grade of secondary school, which will enhance the next research about Science Virtual Test. More widely, this research can also be used as consideration of other similar research about computer-based test/assessment.

G. Organization Structure of Research Paper

This paper is arranged based on these following structures:

1. Chapter I: Introduction

This chapter contains background of the research study, research problem, research question, limitation of the problem, objective of the research, and research significance.

2. Chapter II : Literature Review

For the second chapter, this section will contains the theory and literature explanation about the research variables. In this research study, the literature review is describe about science virtual test, paper-based test, critical thinking, living thing and environmental sustainability as the science topic, Multiple Intelligences, gender, and teachers' perspectives.

3. Chapter III: Research Methodology

This chapter explain the research method and design, sample and population, operational definition, assumption, hypotheses, research instrument, research procedure, data analysis and research flowchart.

4. Chapter IV: Result and Discussion

This Chapter contains data which is obtained and its interpretation, and discussion about the findings of the research.

5. Chapter V: Conclusion and Recommendation

As the last chapter, all research questions are concluded based on the findings, and some recommendations are generated based on the discussion.