

Seventh Grade Students' Scientific Creativity Test: A Preliminary-Study on Earth Science Context

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Abstract. The main purpose of a preliminary-study is to develop the test of Hu & Adey's scientific creativity for seventh grade students on earth science context. Furthermore, the detailed-topics concerning in the context of earth science are the layer of earth, earthquake, volcano and tsunami. The Four-D Model systems-approach is implemented in this research. They are four experts that review the design of scientific creativity; involve two experts in assessment and two experts in the earth and science content. Moreover, the design of scientific creativity has already been developed by recommendations from several experts. The thirty-one students from Bandung city are tested by using this scientific creativity test. To sum up, four experts agreed that seven items which have already been developed are suitable for measuring scientific creativity of seven grade students concerning the earth science context.

1. Introduction

Nowadays in the 21st century, science and technology raises hastily. The raises of science and technology influence to the value of human lifespan, for example in science education area [1]. One of the 21st century skill is creativity. Creativity in science domain called scientific creativity [2]. Hu & Adey extended an established hypothesis regarding the structure of scientific creativity. It is called the three-dimensional Scientific Structure Creativity Model (SSCM) [3]. They assumed that scientific creativity is dissimilar from general creativity then. It is disturbed by the problem finding, problem solving, science experiments, creative imagination, unusual uses, product improvement, and product design. Scientific creativity can be defined as the ability to use scientific knowledge and skills to produce helpful product ability which is a combination of interdisciplinary ranges of science that is original and has convinced social or personal values. Accordingly, the concept of scientific or science and creativity are not separated but fully integrated as a complete new term that is an accurate demonstration of the idea about students' creativity in science and with science [3,4,5,6,7].

Scientific creativity involves sensitivity towards problems since finding creative problems to solve is a main aspect of being an upright scientist [7]. Additionally, the aspect of being a good scientist is framing creative hypotheses. It seems creative scientists frame many hypotheses based on reasonable facts [6]. Scientific phenomena, by meaning, are natural physical phenomena that can be explained scientifically. This mentions simply to observable and measurable phenomena (e.g. tsunamis, volcanos, earthquakes), not to paranormal phenomena (e.g. ghosts and UFOs). Student's scientific concepts are increasing every day;



it is relevant to the scientific phenomena that they experienced in their world [5]. It shows that scientific creativity is important when students learn scientific phenomena (physics or science concept).

The examples of interesting topics in physics are earth and space. On the other hand, it is important for the students, because, Indonesia is one of the country in the world that have a lot of earth and space phenomena, for example, earthquake, volcanoes eruption, and tsunamis. Based on these samples, this research only focuses on the topic of the layer of earth, earthquakes, volcanoes, and tsunamis.

Generally, the purpose of this study is to develop scientific creativity test of seventh grade students. In addition, the specific skills concerning the earth science context; involving the layer of earth, earthquake, volcano, and tsunami

2. Methods

Four-D Model systems-approach is employed in this research. There are several stages covered in the research namely, defining, designing, developing and disseminating stages [8]. In defining stage, scientific creativity test by Hu & Adey is being analyzed. Then, in the designing stage, scientific creativity test is adapted and adopted for the earth and space context [2,9]. There are four lectures consist of two assessment lectures and two earth and space lectures that review the design of adapted and adopted scientific creativity test in the developing stage. After going through the improvement process in the developing stage, scientific creativity test is used to test 31 students in seventh grade at one of the schools in the city of Bandung, Indonesia. They already learned about earth and science in their school beforehand.

3. Results and discussion

The following step on developing scientific creativity test will be elaborated by several steps; they are defining and designing scientific creativity test, rating the result of expert judgments, and analysis of students' answers.

3.1. Definition of scientific creativity test

Scientific creativity described by the three-dimensional Scientific Structure Creativity Model (SSCM), structure of Intellect model which arises from this analysis is shown in figure 1. The proposed structure is designed as a theoretical foundation for the measurement of scientific creativity [2,3,4,9].

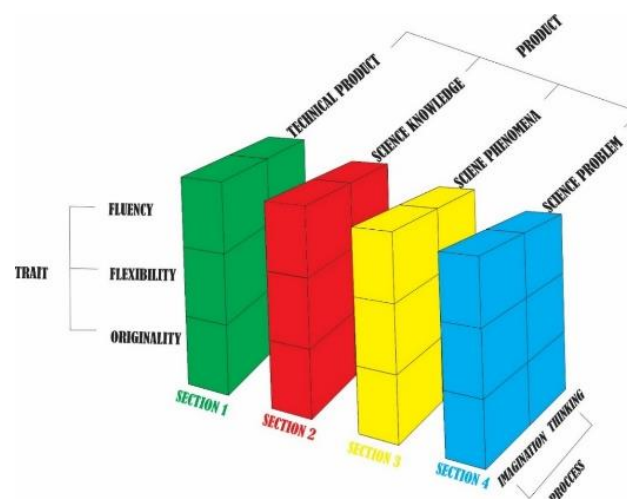


Figure 1. Three-dimensional Scientific Structure Creativity Model (SSCM)

There are 24 cells that become components of scientific creativity; each cell is a combination of three-dimensional models which are a process, a trait, and a product. The main components of scientific creativity illustrated by SSCM are presented into the seven items based on paper and pencil test [3].

3.2. Design of scientific creativity test

There are seven items to measure scientific creativity developed by Hu & Adey [3]. Each component of scientific creativity that described by SSCM is designed into open-ended questions, since it could be used for the development of scientific creativity in science education [6]. One item which already designed to product improvement aspect will be shown in figure 2.

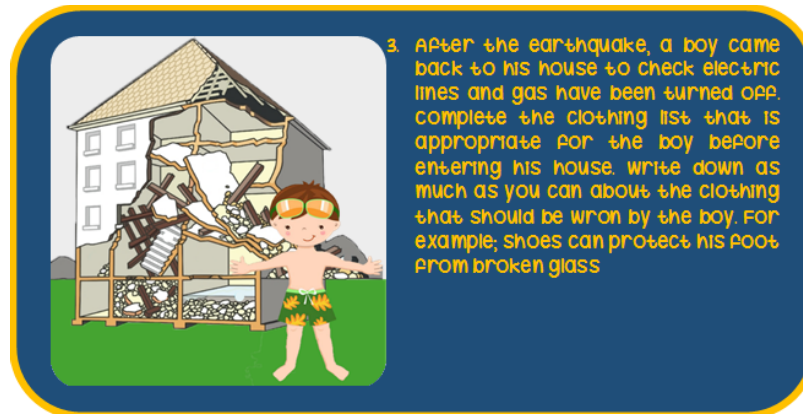


Figure 2. Sample of Scientific Creativity Test-Product Improvement Aspect

3.3. Result of expert judgment

The table below illustrates the result of the experts' judgments for scientific creativity test design; three aspects that are being judged involve grammar, physics content, and the suitability with the reference (Hu & Adey Scientific Creativity test).

Generally, in grammar aspect there are three criteria involving the use of Indonesian standard language, suitability of Indonesian writing convention, and unambiguous. Content aspect consists of four criteria that are judged. There are true physics concept, suitability with seventh grade student, each question doesn't limit the students to answer (open-ended question), and suitability of the pictures/diagrams and the question. Here is the result.

Table 1. Grammar and Content Score from Each Item

Item Number	Grammar Score					Content Score					Suitability with Hu & Adey Test			
	L1	L2	L3	L4	Average	L1	L2	L3	L4	Average	L1	L2	L3	L4
1	3	3	3	4	3.25	3	3	4	3	3.25	√	√	√	-
2	3	3	3	4	3.25	4	3	3	4	3.50	√	√	√	√
3	4	3	4	4	3.75	4	3	3	4	3.50	√	-	√	√
4	4	3	4	4	3.75	3	2	4	4	3.25	√	√	√	√
5	4	3	4	4	3.75	3	3	3	4	3.25	√	√	√	√
6	3	3	3	4	3.25	3	3	4	4	3.50	√	√	√	√
7	3	3	4	4	3.50	4	3	3	4	3.50	√	√	√	√

(L1;L2= Assessment lecture, L3;L4= Earth and Science Lecture)

(Score: 3.1–4.0=Very Good; 2.1–3.0=Good; 1.1–2.0=Good Enough; 0.0–1.0=Poorly Good)

3.4. Student Answer Profile

The scores obtained by students in answering item number 3 tabulated in table 2 with a mean score of 5.00

Table 2. Student's Answer Analysis

Item Number	Scores	Range	Minimum	Maximum	Mean	S.D
Item Number 3	Fluency	6.00	2.00	8.00	3.60	1.45
	Flexibility	1.00	1.00	2.00	1.20	0.41
	Originality	2.00	0.00	2.00	0.20	0.55
	Total	9.00	3.00	12.00	5.00	2.41

4. Conclusion

This study reports a preliminary attempt to develop scientific creativity test concerning the earth science context based on Hu & Adey scientific creativity test. Generally, four lectures agreed that seven items that are already developed are suitable for measuring scientific creativity of seven grade students regarding the earth science context as shown in table 1.

Acknowledgments

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