

The Analysis of the Students' Creative Thinking Skills in Biology Learning

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Abstract: Creative thinking skills are the high-level thinking skills that have an important role and must be owned by every student to face challenges in the 21st century. This study aimed to determine the students' creative thinking skills in the Biology subject. This research applied a descriptive method. The instrument used was a creative thinking test instrument on the biological material that has been integrated with the aspects of creative thinking. The research subjects were 159 twelfth-grade high school students in Surakarta. The results showed that the students' creative thinking skills in the low category were 32.98%. The aspects of creative thinking skills can be detailed as 33.22% in the fluency aspect, 40.16% in the flexibility, 11.61% in the originality, and 49.94% in the elaboration.

1 INTRODUCTION

In the 21st century, education is increasingly important to ensure students have the skills to learn and innovate, use technology skills, be able to sort out the truth of information received, and be able to survive using the skills they possess. Education is one of the most important factors in sustainable development. 21st century education is student-centred, interactive and web-based so that the skills are needed to support learning (Trilling and Fadel, 2009).

The skills needed in the 21st century include critical thinking, problem solving, the ability to collaborate, communicate, creative, scientific literacy, and having an integrated global awareness in learning (Kay, 2009). Creative thinking is one of the skills needed in the 21st century. Creative and effective thinking skills must be possessed by the students as the independent self-development (Asmara, Susantini and Rahayu, 2015). Creative thinking is a divergent thinking process, namely the ability to provide alternative answers and see possibilities for solving a problem based on the information provided (Guilford, 1967). Biology learning for the 21st century generation is adjusted to the needs and demands of the competencies needed (Maghfiroh, Susilo and Gofur, 2016).

Creativity can be seen in the field of science as an invention, which can be an effective factor for developing innovation (Ulger, 2017). Creative thinking is very important to be developed through learning science, especially biology, with the aim of being able to equip students to face challenges and obstacles in the future. Biology is one of the sciences learning that requires skills because in the learning process there is a process of investigation or discovery and gathering of information. Biology is one of the materials that can be used to develop creative thinking skills (Tendrita, Mahanal and Zubaidah, 2016). The empowerment of creative thinking should be applied to learning in schools (Sulistiyono, Mahanal and Saptasari, 2017). Schools as the formal education institutions are the second environment after families which have the potential to grow and develop thinking skills.

The development of students' creativity is one of the educational goals set out in the Law of the Republic of Indonesia No. 12 of 2012 Article 5a namely the development of the students' potential to become people who believe and fear God Almighty, are noble, healthy, and knowledgeable, and have the skills and creativity, independence, competence and culture for the sake of the nation (Departemen Pendidikan Nasional, 2012) The statement contained in the Law of the Republic of Indonesia No. 12 of 2012 Article 5a is strengthened by the Minister of Education and Culture Regulation No. 61 of 2014

which states that one of the competencies needed by the students is to have creative skills.

Creative thinking skills possessed by the students can help in dealing with the problems in learning. This creative thinking skill can also help them to utilize information to survive in the competition and in an uncertain life that is always changing (Sesanti and Marsitin, 2017). According to (Fatra and Maryati, 2017) someone who has creative skills will be an effective person in learning, community, work and in his life. The progress of a nation's development can be done by preparing future generations with knowledge and skills. Creative thinking can create a culture of innovation and change, wherein the learning process is student-oriented (Forrester, 2008).

The importance of creative thinking skills trained and owned is seen based on the benefits that have been described which is not in line with the facts. Based on the Global Creativity Index (GCI) survey conducted by Martin Prosperity Institute, Indonesia ranks 115th out of 139 countries (Florida, Mellander and Stolarick, 2011). (Prianggono, 2012) found in his research that the students' creative thinking skills were zero, which means that they did not have creative thinking skills. In line with this, (Sari, Sumiati and Siahaan, 2013) stated that actually this creative thinking skill is a thinking skill that is often overlooked in the formal education. Because learning that takes place does not train divergent thinking, the students are only able to give one answer when given a question. As a result, they will experience difficulties if faced with a problem that demands creative thinking. Based on this background, there needs to be an effort to train creative thinking skills. Therefore, this research was conducted to find out the creative thinking skills of the students in the Biology subject in one of the senior high schools in Surakarta.

2 METHOD

The method used in the research was descriptive method. The instrument used to measure the students' creative thinking skills was a biological description test that has been integrated by four aspects of creative thinking. The creative thinking aspects used are the aspects of fluency, flexibility, originality, and elaboration. The sample used in this study included all the students of class XII Science in one of Surakarta state senior high schools in the 2016/2017 academic year. The sample consisted of 5 classes symbolized by A1, A2, A3, A4 and A5. The data were analysed using descriptive analysis, with the presentation of data in the form of tables and

percentages. This aims to determine the initial ability of the students' creative thinking in the Biology subject.

3 RESULT AND DISCUSSION

Creative thinking skills in biology learning lead to high-level learning that trains students to become successful learners especially in biology learning. As (Chang *et al.*, 2015) said, creative thinking skills are high-level thinking skills used in problem solving. In this study, the aspects used refer to Guilford's creative thinking skills which are expressed in four aspects. The four aspects are fluency, flexibility, originality, and elaboration (Guilford, 1967). The eight questions used were the integrated questions of creative thinking. The percentage calculation of each aspect of the profile of creative thinking skills tested in the Biology subject is presented in Table 1.

Table 1: The percentages of the students' creative thinking aspect

Classes	Creative thinking aspects (%)			
	fluency	flexibility	originality	elaboration
A1	37.1	41.13	12.10	59.68
A2	19.35	35.48	12.90	25.00
A3	24.19	38.71	14.52	43.55
A4	50	45.16	5.65	51.61
A5	35.48	40.32	12.90	54.84
Mean (%)	33.22	40.16	11.61	46.94

Table 2: The category of students levels of creative thinking aspect (Riduwan, 2010).

Percentages (%)	Categories
81-100	Very high
61-80	High
41-60	Sufficient
21-40	Low
0-20	Very Low

Based on the Table 1, it shows that each aspect of creative thinking is different. The highest percentage can be seen in the elaboration aspect by 46.94%. In the elaboration aspect, the students are required to be able to enrich, develop, add, elaborate, or break down the details of the objects of ideas, main ideas or situations so that they are more interesting. The percentage of 46.94% is categorized as quite creative. The average aspect of flexibility is 40.16%. The flexibility aspect is the ability to solve problems by generating various thoughts or ideas. On average,

40.16% is categorized as quite creative. The fluency aspect is 33.22%. The fluency aspect is an aspect that measures the students' fluency in answering questions, measured by the quantity of the answers within a specified time. (Silver, 1997) stated that the fluency aspect of problem solving refers to the ability of the students to get many solutions. This aspect is categorized as low. The lowest aspect is the originality aspect by 11.61%. The originality aspect is expressed by the ability to generate new thoughts or ideas and develop the existing ideas in their own language. This aspect is categorized as low. In this case, the students show that the ability to produce unique or different ideas is very low when compared to the other three aspects. Hence, it is necessary to do training on the originality aspect and the other three aspects so that the students have good creative thinking skills.

The aspects of creative thinking skills namely fluency, flexibility, originality, and elaboration show a low category by the average of 32.98% respectively, seen in Table 2. This is known from the observations that have been made that the students have not been accustomed to working on the questions that contain the aspects of creative thinking skills. (Sari, Ikhsan and Saminan, 2017) asserted that the teachers are not used to training their students to work on the divergent questions, which require more than one answer. They are not well trained so that when faced with problems that require them to think creatively, the students find them difficult to do. The creative thinking process is the combination of the logical and divergent thinking. Divergent thinking is used to find ideas in solving problems while logical thinking is used to verify these ideas into a creative solution (Siswono and Rosyidi, 2005). The ability to think creatively is the ability or thinking process to provide new ideas that can be applied in problem solving. The ability to think creatively also contributes to the students' learning outcomes themselves. Therefore, it is better to develop creativity trained early on for the students (Subali and Mariyam, 2013).

Creative thinking skills can be empowered with several activities such as identifying problems, brainstorming, composing questions, reading activities, group or individual learning. The existence of the problems raised by the students will stimulate their thinking skills by which they will be able to develop knowledge (Liliawati, 2011). Brainstorming activities aim to enable students to explore creative ideas related to the phenomenon presented, so as to improve their creative thinking skills. The students who play an active role in the learning activities such as digging up information and solving problems in

questions that are prepared or proposed can stimulate their thinking skills.

Questioning activities can stimulate one's thinking. Questions that stimulate creative thinking are divergent or open questions (open-ended questions) (Munandar, 2012). Reading activities can train the discovery process to develop thoughts or ideas so that the students who spend a lot of time reading can improve their creative thinking skills (Wang, 2012). Creative thinking skills can be empowered through group or individual learning approaches (Gomez, 2007).

4 CONCLUSIONS

The results showed that the initial ability of the students' creative thinking skills in the biology learning in the originality and fluency aspects was categorized as low while in the aspects of flexibility and elaboration were categorized as sufficient. The percentage of the four aspects shown is 32.98%, which means that the students' creative thinking skills are still low. Therefore, more attention and training are needed to improve the students' creative thinking skills.

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