

Profile of Students' Creative Thinking Skills in Science Learning

Ida Madyani^{1*}, Sri Yamtinah², Suryadi Budi Utomo³, Sulistyo Saputro⁴, and Lina Mahardiani⁵

¹ Postgraduate Program of Science Education, Sebelas Maret University, Ir. Sutami Street Number 36A Jebres, Surakarta, Central Java 57126 Indonesia

^{2,3,4,5} Postgraduate Program of Chemistry Education, Sebelas Maret University, Ir. Sutami Street Number 36A Jebres, Surakarta, Central Java 57126 Indonesia

^{1*}idamadyani@gmail.com, ²tinaspaputro.staff.fkip.uns.ac.id, ³sbukim98@yahoo.com
⁴sulistyo_s@staff.uns.ac.id, ⁵lina80_ssa@yahoo.com

Abstract: Creative thinking skill is one of the 21st-century skills or also known as 4C that students must have. Creative thinking skill is useful as a source of encouragement, drive, and strength in development, research, and investigation to deal with the industrial revolution 4.0. This study aimed to determine the profile of junior high schools students' creative thinking skills in learning science. Science is one of the subjects that require creative thinking skills. The method used in this study is descriptive analysis. Data were collected through a test, observation sheets, and interviews. Subjects in the study were 126 students from four different junior high schools. The results of this study show that showed students who have high score are amount to 22 people, medium thinking ability level of 46 people and a low level of creative thinking skills of 58 people and the percentage of each indicator on creative thinking from test were thinking fluently is 82%, thinking originally is 38%, thinking flexibly is 61% and thinking of elaboration is 55% while on observation sheets were thinking fluently is 71%, thinking originally is 40%, thinking flexibly is 63% and thinking of elaboration is 59%.

Keywords: creative thinking skills, learning science, 21st-century challenge, industrial revolution 4.0

INTRODUCTION

Creative thinking skill is one of the 21st-century skills students must have. 21st-century skills are often known as 4C (Communication, Collaboration, Critical thinking, and Creativity). Creative thinking skill is useful to deal with the industrial revolution 4.0. The industrial revolution 4.0 was marked by the development of science and technology that developed very rapidly and significantly. To join the industrial revolution 4.0 and the challenges of the 21st century, individuals who can adapt and think creatively are needed (Munandar, 2009). A nation does not only need abundant resources but also requires the ability to think creatively (Mahmudi, 2010) for the superiority of a nation.

The creative thinking skills level of the Indonesian people is very low. It can be seen by the 2010 Global Creativity Index data which states that Indonesia is ranked 81 out of 82 countries. The ability to think creatively (Ghufron, N. & Rini, 2014) is important to have because it is a source of human strength in driving progress in terms of tracing, development, and discoveries in the field of science and technology. Another definition of creative thinking is the ability to solve a problem and the development of a structured way of thinking logically related to the content of knowledge (Prusak, 2015). The developing ability to think creatively will create ideas/ideas, find interrelated relationships, imagined and have many perspectives on things. The low ability of creative thinking will make it difficult for students when problem-solving or questions given by the teacher. Students tend to be less in trying to find alternative answers and difficult to work on problems that have been developed by the teacher. Students can develop

and increase their creative thinking skills (Lou, S., Chung, C., Dzan, W. & Shih, 2012) (Bjorner, T., Kofoed, L.B., & Pederson, 2012) to solve life and environmental challenges later

Science (Kemendikbud, 2017) is one of the important foundations in nation-building. Science and Natural Sciences mean the science of nature that studies events that occur in nature. The definition of Natural Sciences (Chiappetta, 2010) means as a way of thinking, investigating, a building up of science and relating to technology and society. Science is developed on three basic dimensions namely scientific processes, attitudes, and products (Carin, A.A. & Sund, 2014). Creative thinking skills are required in science learning (Fatmawati, 2016). Science learning has the role (Prayekti, 2006) of preparing students to have the ability to think critically, creatively, logically and take the initiative in responding to issues in society caused by the influence of the development of science and technology (Bahriah, 2012) (Kurnia, F., & Fathurohman, 2014) (Rashid, T., & Muhammad, 2016).

Science in Junior High School uses integrated science learning (integrative science) not as a scientific discipline. Integrated science learning (Gie, 2003) is expected to foster scientific process skills are skills (science process skills), thinking skills that are creative thinking and critical thinking and foster a scientific attitude. Science learning requires individuals who can think creatively. Creative thinking (Gie, 2003) is a thought that seeks to create something new. In general, creative thinking is a mental activity in the form of thinking that can produce concepts, ideas, knowledge, understanding, and discoveries. Limitation of creative thinking due to the indicators and implementation is the creation of something new from various ideas, information, ideas, concepts, experiences or knowledge contained in the human mind.

Creative thinking skills are classified as high-level thinking skills (Nehe, M., Surya, E., Syahputra, 2017) with characteristics of authenticity, flexibility, fluency, and elaboration. The ability to think creatively (Torrance, 1965) can be divided into three, namely: (1) Fluency (fluency); (2) originality; (3) elaboration. Characteristics of creative thinking ability (Silver, 1997) include fluency, flexibility, and novelty, while the characteristics of creative thinking skills related to cognition (Munandar, 2009) include: thinking fluently, thinking flexibly, thinking original, thinking in detail (elaboration) and think to assess (evaluation).

The indicator of creative thinking skills related to the cognition domain includes (Munandar, 2009) which is: 1. Think smoothly, that is (a). Trigger a lot of ideas in problem-solving; (b). Give a lot of answers in answering a question; (c). Provide many ways or suggestions for doing various things, and (d) Work faster and do more than other children; 2. Think flexible, that is (a). Generate variations in the idea of solving problems or answering a question; (b). Able to see a problem from a different perspective and (c). Present a concept in different ways; 3. Think originally, that is (a). Provide a relatively new idea in solving a unique problem or answer, different from what is usual in answering a question; (b). Create unusual combinations of parts or elements; 4. Think in detail (elaboration), that is (a). Develop or enrich other people's ideas, and (b). Add, organize or specify an idea to improve the quality of the idea; 5. Thinking in value (evaluation), that is (a). Able to find the truth of a question or the truth of a plan for problem-solving (justification); (b). It can trigger the idea of solving a problem and can implement it correctly, and (c). Present a reason that can be accounted for in reaching a decision.

Not all indicators are used in this study. Indicators of creative thinking skills used in this study are fluency, flexibility, originality, and elaboration (Azhari, 2013). The level of ability to think creatively in this study will be divided into three categories, namely high, medium and low. The four indicators of creative thinking ability are by the aspects of creative thinking skills that this development research requires. In addition to these four indicators, in general, can

represent the creative thinking skills that students must have to face the challenges of the 21st century. The profile shall reflect on the students' creativity ability.

Every student has different creative thinking abilities. Based on the explanation above, the importance of the creative thinking skills in facing the challenges of the 21st century, such as the industrial revolution 4.0 becomes the reason why researchers were encouraged to know the profile of students' creative thinking skills in junior high school in Surakarta when learning science.

METHOD

The method in this study uses descriptive analysis research using quantitative data. Data was collected through the test and non-test techniques namely tests, observation sheets, and interviews. The purpose of this study was to determine the ability of creative thinking junior high school students in science learning. Observation sheet data is obtained when the learning process takes place. Tests and interviews are conducted after learning.

The subject of the interviews is the teachers and students of science subjects. The subjects in this study were class VII in four junior high school schools in Surakarta with different categories of high, medium and low. The samples used were 126 students. The sampling technique used is an accidental sampling technique. Accidental sampling technique is a sampling technique whose subject can come from any class.

Determination of students' creative thinking abilities related to statistics through categorization based on average values and standard deviations. The categorization of the average value and standard deviations (Arikunto, 2010) listed in Table 1 namely high, medium and low.

Table 1. Determination Level of Students Creative thinking skills

Value	Group
$s \geq (\bar{\chi} + SD)$	High
$(\bar{\chi} - SD) < s < (\bar{\chi} + SD)$	Medium
$s \leq (\bar{\chi} - SD)$	Low

SD = standard deviation

$\bar{\chi}$ = average student grade

To find out the percentage of students' creative thinking abilities on each indicator, it is sought with the results of students' answers analyzed by percentage of the average scores obtained on each indicator of students' creative thinking abilities used in this study. Interpretation of the indicators of students' creative thinking abilities (Riduwan, 2010), among others, is very good, good, sufficient, bad and very bad is seen in Table 2

Table 2. Interpretation of Students' Creative Thinking Levels

Percentage (%)	Interpretation
81-100	Very good
61-80	Good
41-60	Sufficient
21-40	Bad
0-20	Very bad

RESULTS AND DISCUSSION

1. Test

A test used in this study is a 5-item essay test. This essay test is adapted to the indicators of creative thinking abilities used in research that are fluent, flexible, original and elaboration.

The example of the essay question is shown in Table 3.

Table 3. The Example for Essay Question

Aspect	Indicators of Creative Thinking Skill	Question	Answer and Scoring
Flexibility	a. Produce variations in the idea of solving problems or answering a question; b. Able to see a problem from a different perspective c. Present a concept in different ways	At night you have trouble sleeping because you feel hot. How do you try to avoid the heat in the room so you can sleep?	1. Turn of the lamp 2. Turn on the AC 3. Take a bath 4. Change clothes 5. etc 4 = Give answers in more than one way (diverse), the acquisition process is correct 3 = Give answers in more than one way (various) but the results are wrong because there are errors 2 = Provide answers in one way, the acquisition process 1 = Giving answers is only one way but giving wrong answers 0 = Not answering or giving answers in one or more ways but all are wrong

Results of tests are grouped into 3 categories: high, medium and low. The results of the test and are shown in Table 4.

Table 4. Results of Test to Creative Thinking Skills

Criteria	Category	Number of Students	Percentage of Student (%)
Score ≥ 20	High	22	17.46
$10 \leq \text{Score} < 20$	Medium	46	36.51
Score < 10	Low	58	46.03

Based on the data in Table 4, it shows that students who have a high level of creative thinking skills amount to 22 people, medium thinking ability level of 46 people and a low level of creative thinking skills of 58 people, with successively the percentage obtained is 17.46 %, 36.51%, and 46.03%. The results of this test are also supported by any researchers (Nurhamidah, D., Masykuri, M., Dwiastuti, 2018) (Sugiyanto, F.N., Masykuri, M., 2018) that is the students from the schools with high, medium, and low academic rank has low creative thinking skill.

The data above is then detailed based on each indicator of creative thinking skills and observation sheets used in this study. The average percentages in each indicator in creative thinking skills based on the indicators that have been breaking down are shown in Table 5.

Table 5. Mean Score of Each Indicator of Creative Thinking Skills from Test

Indicators of Creative Thinking Skills	Percentage (%)	Interpretation
Fluency	82	Very good
Flexible	61	Good
Original	38	Bad
Elaboration	55	Sufficient

Elaboration on aspects of creative thinking ability can mean that students can find truth in a question or problem and have reasons that can be accounted for in reaching a decision. While the indicator of thinking flexibly in creative thinking skills can be interpreted that students can produce variations of ideas in solving problems or providing answers, students can see a problem or question with several points of view. The results of thinking flexibly are slightly higher than elaboration. Students can produce various variations of ideas in answering questions compared to students who must find the right answer in each problem or question given. Students tend to be able to provide various answers but are unable to select an account for their answers correctly or not.

Fluency refers to the truth and diversity of answers given by students, the aspect of flexibility refers to the different ways given by students in solving problems, while novelty refers to the answers given unusual to the level of student knowledge in general and refers to new ways that are displayed students and new ways that are a combination of knowledge obtained by previous students (Endang Krisnawati, 2012).

The most important characteristic in novelty or original is that it is different from the others or previously existed, flexibility is seen by showing the productivity of ideas used to solve a problem, fluency is seen by the smoothness of students in producing ideas, answers, solutions and different ideas according to questions, conditions and requests.

2. Observations

Observations in this study used indicators of creative thinking ability which consisted of thinking fluently, thinking flexibly, thinking originally and thinking of elaboration. These indicators are described as sub-indicators. Observations are carried out during the learning process. This observation will create and identify students' creative thinking skills following the indicators and sub-indicators used.

Table 6. Mean Score of Each Indicator of Creative Thinking Skills from Observation Sheets

Indicators of Creative Thinking Skills	Percentage (%)	Interpretation
Fluency	71	Good
Flexible	63	Good
Original	40	Bad
Elaboration	59	Sufficient

Based on Table 6, it can be seen that the indicator in creative thinking ability which has the lowest percentage is thinking originally which is 40%, it shows that most students are less able to think original in generating and creating new ideas. While the highest percentage of 71% is in

the indicator of the ability to think fluently. The statement was proven in observations and interviews that students smoothly answered questions but the answers provided were common and less unique answers or less creative. When learning science, students are quite fluent in answering questions but the answers they give are less original in other words the answers they give do not give rise to creative thinking skills of original indicators. The creative thinking skills of the indicator are thinking flexibly and the mean score is 63%. These results are slightly higher than the elaboration indicators in creative thinking skills which only get a percentage of 59%.

The results of observations generally include: (1) Students are not fluent in giving answers; (2) Students are less able to think openly in answering questions; (3) When the teacher gives a question, the student does not immediately take the initiative to answer; (4) Students tend to answer questions whose answers have been printed on the textbook; (5) Students provide examples according to what the teacher gives; (6) Students are less able to combine information that has been given by the teacher to provide examples or other answers to a question; (7) Students are less able to give ideas about things with several different points of view; and (8) Students are less able to create their own new and different ideas than usual.

3. Interviews

The interviews in this study were used as supporting data. The subjects in the interviews were not only students but also teachers. The focus of the interviews in this study was to find out and confirm the reasons and explanations of students during the learning process and to find out the ability to think creatively on each indicator in general based on teacher observation during learning. Interviews are conducted after the learning process.

The topic of interviewing students and teachers is related to indicators of creative thinking skills that students have both according to the teacher and the students themselves. The results of the interview with the teacher stated that from the four indicators of creative thinking skills studied it was proven to be true that students indeed had difficulty raising new ideas. Students tend to accept the material given by the teacher without wanting to be creative in thinking about unique ideas related to certain materials. In addition to students who are less able to come up with ideas, students are also less able to find the right answers and are unable to maintain the answers if given several different conditions but have high similarities. Students can answer fluently but the answers given are common answers or answers that are repetitions of the material that the teacher and students have given to see the answers to the package and other learning resources.

Interviews with students produce several opinions that students find it difficult to obtain new ideas that are different from others. The statement is also seen when the learning process takes place, where the answers given by students refer to the textbooks and explanations from the teacher. The statement also proves that students are easy to give some answers (fluent) but the answers given are less original than the results of their creative thinking. The lack of elaboration ability of students is also seen during interviews when giving answers but then students are urged to say the reason for choosing the answers students lack confidence in answering other than that the answers given by students are derived from the ability to read and memorize. Students are less absorbed in the material so they are less able to come up with new and unique ideas and the pattern reflects on the profile of students' creative thinking skills.

The results of this study are supported by other studies (Siswono, 2011) that students who do not have indicators of flexibility and originality are seen in student answers that tend to be the

same in the ways, steps or examples described by the teacher or listed in the textbook. Based on these statements, it appears that students are less able to provide answers even though students can solve questions in different ways but do not show ideas, ideas or new concepts from solving the problem.

CONCLUSION

Based on the results and discussion in this study, it can be concluded that the profile of the creative thinking skills of students in VII class of a junior high school in Surakarta. The results of this study show that showed students who have high score are amount to 22 people, medium thinking ability level of 46 people and a low level of creative thinking skills of 58 people and the percentage of each indicator on creative thinking from test were thinking fluently is 82%, thinking originally is 38%, thinking flexibly is 61% and thinking of elaboration is 55% while on observation sheets were thinking fluently is 71%, thinking originally is 40%, thinking flexibly is 63% and thinking of elaboration is 59%.

This research is expected to be able to be taken into consideration for other researchers to investigate further and find ways to overcome the differences in creative thinking skills. The results of this study are expected to find a solution in learning especially science learning. Problem-based learning and projects related to daily life by paying attention to the development of science and technology are considered to be able to bring up students' creative thinking skills as a provision in facing the world of work.

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