STUDY OF STUDENTS' CREATIVE THINKING ABILITY IN SOCIO-SCIENTIFIC ISSUES INTEGRATED SCIENCE LEARNING

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Abstract

Creative thinking skills are needed in this growing era, especially for the next generation of students. Creative thinking skills help students find new ideas as a solution to problems faced in real life. This study was conducted to investigate learning integrated with SSI approach to enhance students' capacity for original thought in science courses. The research used a mixed method with quasi-experimental design and secondary document analysis on one treated class. Prior to and following treatment, students took a pre-test and post-test on creative thinking skills. The findings revealed a Sig value of 0.008 indicating that there is a relationship and influence between SSI integrated learning and students' creative thinking skills in science learning. The data shows the highest value of 92.5% on the flexibility, and 90.24% originality, while the lowest value is 28% on the elaboration. Each student has a different creative thinking ability and can be seen from the tendency in the achievement of each indikator on creative thinking ability.

Keywords: *Creative Thinking; Learning; Science; SSI*

INTRODUCTION

Education has a big role in realizing the next generation of the nation who are ready to compete in facing challenges along with the times and technology. The development of education today is more focused on the development of 21st-century skills, or the "4Cs"-critical thinking and problem-solving, creativity and innovation, communication, and teamwork-is the main focus of education today (Vari, 2022). In line with the statement of that one of key high-level abilities in education that is helpful for expanding and depending knowledge and experience as well as for resolving issues in daily life is creative thinking. Individuals are expected to be open to innovation and careful in following technological developments (Muradoğlu et al., 2022). Facing today's global challenges, students need to be trained to think creatively in finding solutions to various complex problems. As a result, education must be able to form a generation that is more adaptive, solutive and creative. Creative thinking skills involve flexible and imaginative thinking processes that allow students to come up with original solutions to challenges and problems faced. If students exhibit multiple signs of creative thinking abilities, it might be concluded that they process these abilities. According to Treffinger et al (2002) creative thinking ability has four indicators, namely fluency, flexibility, originality, elaboration. Some also recognize the indicator of metaphorical thinking in the theory of creative thinking although it is not specifically associated with a particular character. The capacity to generate multiple ideas, methods, recommendations, questions, concepts, and alternate responses without being stuck on one concept in a given amount of time is known as fluency. The capacity to generate diverse concepts, responses, or queries derived from various viewpoints without becoming inflexible through a shift in perspective is known as flexibility. Originality or novelty is the ability to create and develop new and unique ideas, expressions, and answers (Fakhirah et al., 2023). The capacity to develop, add, ideas, products or situations as a whole to be more interesting is known as elaboration, while the capacity to create new connections through analogies is known as metaphorical thinking. Each indicator of creative thinking ability will direct students to think creatively in solving a problem.

Science learning is closely related to students' creative thinking skills, especially through methods that involve experiments, projects and problem solving. There are still many science lessons in schools that use conventional and less contextualized learning methods,

so that learning becomes passive, less involving students in the learning process and students find it difficult to develop creative thinking skills. In addition, it is often found that students consider science as a difficult and less interesting subject because of the application of inappropriate learning strategies. Learning using the right methods can encourage students to think flexibly, generate original ideas, and develop complex solutions to real scientific problems, thus supporting the improvement of thinking skills. Learning will be more interesting when implemented with innovative activities and not monotonous through rote methods (Rahmawati & Atmojo, 2021). Approaches additionally serve a significant part in encouraging a growth of creative thinking skills in science learning. The socio-scientific issue approach is one approach that is oriented towards 21st century skills (Purwaningrum & Fauziah, 2022). The socio-scientific issue (SSI) approach is able to stimulate students' potential in solving problems and finding creative solutions and new ideas related to current issues.

The socio-scientific issue (SSI) an approach related to social and scientific problems that are unstructured, have a relationship with morals and ethics, and have uncertain solutions (Qamariyah et al., 2021).This statement shows that the socio-scientific issue (SSI) approach focuses on social issues related to science, encouraging students should be able to think critically, flexibly, and creatively while addressing actual issues. Students have the freedom to construct knowledge independently facilitated by the teacher. The learning model combined when learning science also plays a substantial part in efforts to develop students' abilities in creative thinking through activities that are tailored to the learning flow and approach used. Science learning must be well planned with appropriate learning tools (Silalahi et al., 2021). Learning tools can include learning models used, methods, approaches, strategies and even media needed for learning activities. One of the models that can be used in science learning is discovery learning. The discovery learning model can help students to develop problem-solving and self-organizing skills (Halawa & Darmawan Harefa, 2024). Students are given a stimulus to be fully active in learning and searching for concepts and principles that have been determined.

Based on the result of Suwiti (2022) research, it is stated that learning with the discovery learning model can build students' habits in expressing ideas for problem solving, increasing understanding, ensuring that the understanding obtained is correct, and sticks longer. Students are given the opportunity to work together in groups to discuss, find solutions to problems, present data from discussions and present them anda make conclusions. Therefore, it is hoped that the discovery learning model can train and develop students' creative thinking skills through analysis and problem-solving activities. Another opinion from Prasetyo & Abduh (2021) claim that the model of discovery learning emphasizes more on exploring and solving problems to combine or form new knowledge that focuses on direct student involvement. According to Dehong et al (2020), the discovery learning model comprises six syntaxes which include stimulation, recognizing a problem, data collection, analyzing data, verification and generalization. Model of discovery learning is suitable with the socio-scientific issue (SSI) approach because with this approach teachers can provide social problems related to science. The pupils are offered the opportunity to create solutions to the problems presented. However, in this study, temperature, heat and expansion materials were chosen which involve science concepts and can be related to social issues in it.

Science learning contains many direct student activities in scientific thinking, resulting in new scientific products. Science learning involves students directly and actively in understanding the surrounding nature and applying it in everyday life (Kasmalaili, 2021). Science learning material is always related to scientific thinking about surrounding objects, so students are required to think creatively in an effort to develop the ability to create, understand, and produce new scientific products (Wahyuni & Witarsa, 2023). In the merdeka curriculum, pupils are also offered the opportunity to explore and channel their abilities through learning. Learning with a combination of discovery learning model and socio-scientific issues approach can influence the way students think and act through direct experience. Beside being able to develop creative thinking skills, students are also able to

have learning experiences that are contextualized with problems and events in the real world. Learning like this can increase student creativity and innovation that is still latent and has not been optimized (Widia, 2020). The integration of the socio-scientific issue approach with the discovery learning model in science learning is still rarely done, even though learning with this strategy has great potential in improving 21 st century skills, one of which is the ability to think creatively. The purpose of this study was to determine whether science learning integrated with the socio-scientific issue (SSI) approach can improve students' creative thinking skills and whether each indicator of creative thinking skills can be achieved. The findings of this study are intended to help provide references in the development of innovative and relevant science learning strategies to improve 21st century skills, especially in creative thinking skills. As an effort to improve students' creative thinking skills, educators need to implement science learning with an integrated socio-scientific issue approach with a discovery learning model as well as adapted to the needs of students.

METHOD

The investigation employed a mixed approach with a quasi-experimental design conducted in one class using both pre and post-test techniques and secondary document analysis. The research flow was adapted from one of Creswell & Clark (2007) mixed methods explanatory sequential designs which was adjusted to the researcher's needs. The stages of this research can be seen in Figure 1, with the first stage is to collect quantitative data through pre-test and post-test to measure students' creative thinking skills in SSI integrated science learning and the relationship between the two. After the quantitative data is collected, data analysis is carried out using statistical techniques. The resulting quantitative data is then interpreted, and then used as a document for qualitative data collection. Qualitative data comes from secondary data from test results and the results of quantitative data interpretation. The secondary data that has been collected is then analyzed to find patterns of trends in indicators met by students and to determine the relationship between indicators of creative thinking skills. Patterns and trends that have been successfully analyzed are then interpreted.

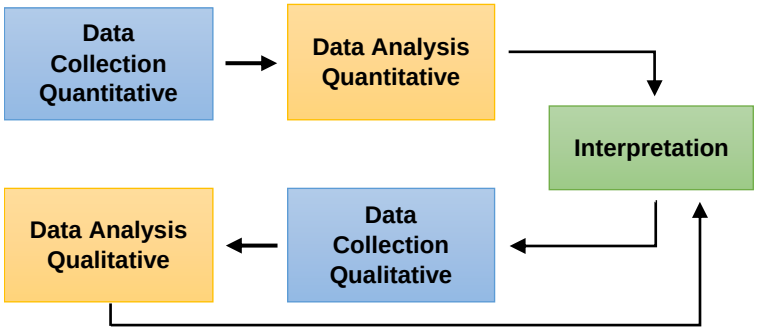

Figure 1. Research flow
Source: (Creswell & Clark, 2007)

Participants and Research Situation

The research was carried out in any of the junior high schools in Ponorogo Regency, East Java. The student population in the school was less than 1000 from grades seven, eight, and nine with diverse backgrounds. The sample was taken from the seventh grade, which was taught by the researcher with 31 students participating in the quasi-experimental research. Learning was conducted using conventional model and discovery learning model integrated with social science topic. Pre-test was conducted after learning with conventional methods to determine students' creative thinking ability before the realization of socio-scientific issue integrated learning. Post-test was conducted after the realization with discovery learning model integrated with socio-scientific issue (SSI). The test items were designed and arranged in an online test form that could be answered by class VIII students

after participating in learning with conventional methods and learning with discovery learning model integrated with socio-scientific issue.

Instrument

The instrument employed in quantitative research is a creative thinking skills test instrument that has been previously validated with satisfactory reliability and validity used in this study. The questions on the creative thinking skills evaluate were in the form of multiple choice. Students were tasked answer to questions related to the material being taught. 10 test items were proposed to assess students' skills in fluency in generating ideas (2 points), flexibility in generating a variety of answers (2 points), originality in generating ideas and alternative answers (2 points), elaboration (2 points), and metaphorical thinking (2 points). The questions on the test were aligned with the indicators of creative thinking skills, which include fluency, flexibility, originality, elaboration, and metaphorical thinking. Qualitative research instruments use secondary documents derived from pre-processed test score data.

Data Collection

Seventh grade junior high school students attended the class for four sessions. The first two sessions, namely the first and second sessions, conducted science learning with conventional methods. The next two sessions, namely the third and fourth sessions, were conducted with the discovery learning model integrated with socio-scientific issues (SSI). Quantitative data collection was done by answering creative thinking ability test questions through pre-test (before treatment) and post-test (after treatment). The pre-test and post-test lasted one class period, which is 40 minutes. Qualitative data collection is done by analyzing secondary data in the form of results of answering questions on several tests that were administered.

Data Analysis

Quantitative research data analysis using SPSS to test whether the application of learning with a discovery learning model with a social science theme approach has an influence on students' creative thinking skills and to determine the level of achievement of each indicator using paired t-test and N-gain test. Paired t-test is used to determine the effect and relationship of the application of discovery learning with a social science problem approach on students' creative thinking skills. N-gain test is used to determine the accordance of each indicator of creative thinking skills seen from the percentage. Data analysis of qualitative research results was carried out by finding new findings related to the relationship of indicators on creative thinking skills through secondary data analysis of test results. In addition, analysis of data was carried out to identify the tendencies of students on the indicators of creative thinking skills. The qualitative data that has been collected is processed by calculating the scores from students test results using the formula in (1).

$$\text{Score} = \frac{\text{Score Obtained}}{\text{Maximum Score}} \times 100\% \quad (1)$$

The results of the score data in the form of a percentage can then be used as a guideline to determine the criteria for creative thinking ability. The criteria used can be seen in Table 1.

Table 1. Criteria For Creative Thinking Ability Level

Percentage Score	Category
P ≥ (M + SD)	High
(M – SD) < P > (M + SD)	Medium
P ≤ (M – SD)	Low

Source: (Jamnais et al., 2024)

RESULT AND DISCUSSION

This study measured students' creative thinking skills in science learning using five indicators. The creative thinking skills test was administered to students before and after the treatment in science learning activities in the classroom. Before treatment, students engaged in science learning with conventional learning models and methods, while after treatment, students engaged in science learning with discovery learning models and socio-scientific issue (SSI) approaches. Statistics on the results of students' creative thinking skills before the treatment was obtained through pre-test, while after the treatment was obtained through post-test. Table 2 displays information on the highest, lowest, and average scores.

Table 2. Comparison Of Values Before And After Treatment

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	31	20	70	41.94	13.520
Post-test	31	10	100	85.16	23.219
Valid N (listwise)	31				

According to the information in Table 1, the maximum pre-test score on conventional science learning is 70 and the minimum score is 20. The maximum post-test score on socio-scientific issue (SSI) integrated science learning is 100 and the minimum score is 10. Although the post-test score required was less than the pre-test, the top score is higher than the pre-test. Additional findings indicated that the mean score in the post-test was greater in comparison to the pre-test, with the mean score in the post-test being 85.16 and the mean score in the pre-test being 41.94. The difference between the average pre-test and post-test scores was 43.22, this indicate there was an increase after students received treatment through science learning with the discovery learning model and the socio-scientific issue approach.

The improvement in the highest score from 70 in the pre-test to 100 in the post-test indicates that some students succeeded to obtain better outcomes after the application of the discovery learning model and the socio-scientific issue approach. Conversely, the decrease in the lowest score from 20 in the pre-test to 10 in the post-test indicates that there are some students who have decreased scores with the possibility of having difficulty with new learning models and approaches. No less important result is the increase in the average score from 41.94 in the pre-test to 85.16 in the post-test. The average increase of 43.22 shows that overall students experienced an increase in understanding and creative thinking skills after participating in science learning with the discovery learning model and socio-scientific issue approach. High creative thinking skills will certainly lead students to develop scientific products that are relevant to the times.

The increase in the average student score indicates the impact of the discovery learning model on enhancing students' creative thinking skills compared to conventional science learning. In line with research conducted by Sholihah et al (2023) that the application of the discovery learning model affects creative thinking skills as shown through an increase in the average test score. Based on these results, before the learning treatment was carried out using a boring conventional learning model through lectures and questions and answers, so that the teacher was still the center and students became less active. Next, learning is carried out using the discovery learning model to create more enjoyable learning and actively involve students to find and identify a problem in real life. In line with research conducted by Sohilait (2021), that the discovery learning model has a positive effect on students' creative thinking skills rather than using conventional methods, because this model is designed to help students develop creative thinking skills in solving problems. The learning process applied with the discovery learning model is able to foster their inquisitive attitude towards the problems presented, thus creating student-centered learning (N.L.T. Arlita et al., 2023).

The implementation of learning with the discovery learning model can have a significant influence through the syntax or steps in this learning model, one of the syntaxes in this learning model that is suitable to be combined with the socio-scientific issue approach is

to provide stimulus and problem identification. The stimulus given to students can be in the form of issues, scientific phenomena and problems that are relevant to real life and related to science material. The stimulus provided by the teacher will direct students to identify problems or phenomena and create a solution with their creative thinking skills. For example, research by Sulastri et al (2024) found that the use of stimuli in the form of social science issues in the discovery learning model had a significant effect. Thus, providing stimulus in the form of social issues or phenomena through socio-scientific issues (SSI) students not only gain an understanding of the context of science, but also critical thinking skills, science literacy, and important problem solving needed to face the challenges of this century (Chomsun et al., 2024).

The research shows good results, but further analysis is needed to understand the factors that influence some students to experience a decline in grades after the implementation of socio-scientific issue integrated science learning. Some possibilities that can affect this decline are because students are still trying to adapt to the discovery learning method with the socio-scientific issue approach which requires them to link learning materials with social issues and requires them to find their own information both from group discussions and from other learning media but still guided by the teacher. The lack of variety of media and teaching materials can also be a factor in some students experiencing a decline in grades, because the material is given through power-point presentations and textbooks. In accordance with research conducted by Kristiana et al (2022) that the learning model affects the quality of learning and needs to be supported by appropriate learning tools so that it can have implications for student skills. Furthermore, the research of Sarıoğlan & Özkaya (2023) shows that the model and media used in learning have an effect on students' academic achievement, creativity, and metacognition. Therefore, teachers need to prepare learning media that are varied, understandable and acceptable to students, able to hone and develop creative thinking skills adapted to discovery learning integrated with socio-scientific issues (SSI). Teachers are not only required to be able to channel knowledge but also skills to students through learning models and innovations to maximize student learning outcomes (Widodo et al., 2023).

Table 3. Relationship Between Pre-Test And Post-Test

		N	Correlation	Sig.
Pair 1	Pre-test & Post-test	31	.466	.008

The result data based on Table 3 obtained a sig value of 0.008, which indicates that sig <0.05, then between the pre-test and post-test has a relationship and there is a significant effect on the difference in treatment given by each learning model on students' creative thinking skills. The significance level of 0.008 obtained based on Table 2 shows that the results of the pre-test and post-test show a substantial correlation. The sig value <0.05 indicates that the difference in treatment with learning models has a substantial effect on students' creative thinking skills in science learning. According to the findings, it was found that the discovery learning model with socio-scientific issue approach successfully influenced students' creative thinking skills significantly seen from the test results. The applied discovery learning model with socio-scientific approach has effectiveness in improving students' creative thinking skills because of the significant relationship.

The successful integration of discovery learning model and socio scientific issue approach can be attributed to several main factors. The first factor relates to the discovery learning model that can encourage students to be active in exploring problems and finding solutions independently, thus improving creative thinking skills. In accordance with research conducted by Syahrin et al (2019), that creativity in expressing ideas arises through the experience of incorporating new information and the presentation of various problem-solving techniques supported by the foundation of thinking. The second factor is that the socio-scientific approach is able to provide a learning context that is relevant to real life, thus allowing students to be more interested in solving problems related to social and scientific

phenomena. This is in line with the statement from Sulistina et al (2024) about the application of the problem-based SSI approach showing a positive influence on students' abilities because it can facilitate students to realize their knowledge on real-life problems. The results of the integration between discovery learning and socio-scientific issues are suitable to be combined because the processes are interrelated, so it can increase student involvement in learning and develop creative thinking skills. The discovery learning model facilitates and provides space to explore and find solutions to problems related to social science. Students will focus more on ideas in responding to the issues presented by exploring and investigating information related to the issues through group discussions Kenari & Wijaya Subiantoro (2023). Of course, this discussion needs to be understood in a broader context. Some other factors such as classroom conditions and student circumstances may affect the results. Although the results showed a significant effect, further analysis and studies are needed to understand more comprehensively how and why science learning with this model is effective.

Table 4. Results Of Categorizing The Level Of Students' Creative Thinking Skills

Score	Category	Frequency	Percentage
P ≥ 108.38	High	13	41.94%
61.94 < P > 108.38	Medium	14	45.16%
P ≤ 108.38	Low	4	12.90%

Based on table 4, 31 students have taken the creative thinking ability test. The results show that as many as 13 children have high thinking skills with a percentage of 41.94%. A total of 14 students were categorized as medium creative thinking skills with a percentage of 45.16%, while 4 students had low creative thinking skills with a percentage of 12.90% of the population. This proves that each student has different creative thinking abilities from one another (heterogeneous). Although some students fall into the same category of creative thinking ability, they certainly have their own tendencies and uniqueness which is certainly different from other students.

Table 5. Achievement Of Each Indicator

Indicator	Score Pre-test	Score Post-test	N-Gain	%
Fluency	19.35484	79.03226	.74	74
Flexibility	35.48387	95.16129	.925	92.5
Originality	33.87097	93.54839	.902439	90.2439
Elaboration	59.67742	70.96774	.28	28
Metaphorical Thinking	61.29032	87.09677	.666667	66.66667

The results based on Table 5 show that each indicator has a different score and percentage. The fluency indicator is 74%, flexibility is 92.5%, originality is 90.24%, elaboration is 28%, and metaphorical thinking is 66.67%. These results show a significant variation in the scores and percentages of each indicator of students' creative thinking ability after the implementation of the discovery learning model and the social science approach.

The percentage of 74% of the fluency indicator, which is the capability of students to create ideas fluently, can be said to be good. This shows that most of the students are able to express many ideas fluently in the given learning context. Flexibility with a percentage of 92.5% is the highest compared to other indicators. This percentage shows that the students are able to think flexibly by changing perspectives and strategies in solving problems given in learning. Students are said to be able to adapt very well to the learning approaches and models used. The percentage of originality is 90.24% which is the ability of students to generate unique, innovative and original ideas. This indicator is also high, which indicates that the discovery learning model with the applied socio-scientific theme approach successfully motivates students to adopt a non-traditional perspective and produce innovative and different solutions from most. Elaboration occupies the lowest percentage which is 28%. The low percentage in the elaboration indicator indicates that students still

have difficulty in expanding or adding to their ideas. This is an indicator that requires more attention in the learning process by providing more stimuli that can help students develop and expand their ideas. Following the assertion made by Nisa Auliyah et al. (2021) that teachers should be able to provide stimuli for students to engage in creative activities and help them find the necessary infrastructure. Metaphorical thinking is the fifth indicator with a percentage of 66.67%. This percentage shows quite good results where students are able to use analogies or comparisons to understand more abstract concepts, but this indicator will also be better if improvements are made. These results show that students tend to still have difficulty in understanding and analyzing test questions, so they are wrong in determining answers, especially on questions related to the elaboration indicator because the scores are very low.

As a result of the analysis of the previously processed data, several tendencies of students were found on the indicators of creative thinking ability. The students' tendencies form several patterns. Each pattern has a tendency on different indicators of creative thinking ability. The pattern of tendencies can be seen in Figure 2.

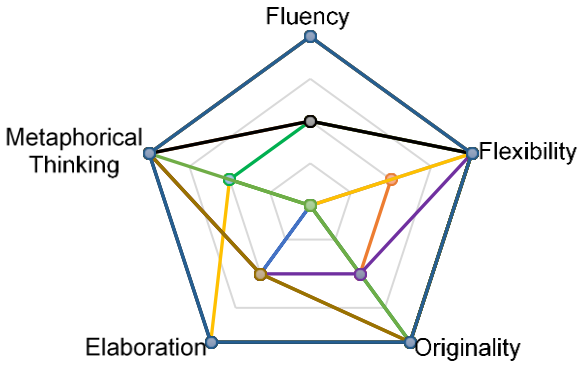

Figure 2. Students' Trend Pattern On Creative Thinking Ability Indicators

Figure 2 shows the patterns formed due to the tendency of students on the indicators of creative thinking ability. Judging from Figure 2, it is known that not all students fulfill all five indicators of creative thinking ability, some even only fulfill one indicator. Some students are indicated to have creative thinking skills by fulfilling all five indicators. The patterns in Figure 2, show the levels of students' creative thinking skills given a stimulus through science learning with discovery learning and socio-scientific issue (SSI) approach. Each student's tendency has a different pattern that is identified through the indicators that are met and seen in each student. There are students who only fulfill one indicator, two indicators, three indicators, four indicators, even up to all five indicators. Although the number of indicators met is the same, the indicators and the level of achievement may be different. There are some students who fulfill three indicators on flexibility, originality, and metaphorical thinking, but the level of achievement on the metaphorical thinking indicator is different which causes different patterns to appear. In this study, it was found that almost 50% of seventh grade students had creative thinking skills with all five indicators

Although some students have met the five indicators of creative thinking ability, the achievement of each indicator is different, of course, giving rise to different tendency patterns. Reflecting on the research of Rahmayanti et al (2024), found that in learning the form of substances, some students conducted the same experiments and did not vary, so they did not fulfill the novelty aspect. The level of skill in its development will not always be the same from one to another because it is influenced by several factors Baysal et al (2022). Variations in the achievement of creative thinking ability indicators may be influenced by several factors in the classroom such as the classroom environment, student conditions, student understanding of the material, and students' own thinking. In addition, each student has unique characteristics, including intelligence, learning style, motivation, and interest, so it is possible that the level of students' creative thinking ability is not the same as one another.

According to Bebasari & Suhaili (2022), every individual has differences in terms of physical and psychological, so students' motivation and interest in learning activities can affect their level of engagement and achievement. This proves that it is very likely that there are always variations in the achievement of students' creative thinking skills in socio-scientific integrated learning and discovery learning, due to heterogeneous students. Based on research Jamnais et al (2024), that the level of students' liking for science subjects can affect their thinking ability, because when faced with problems about science students who dislike it will find it difficult and unhappy in doing the test as a result it has an impact on the results.

The indicators of creative thinking ability have a relationship with each other. This relationship is then able to create creative thinking in students. The relationship between the creative thinking indicators can be seen in Figure 3.

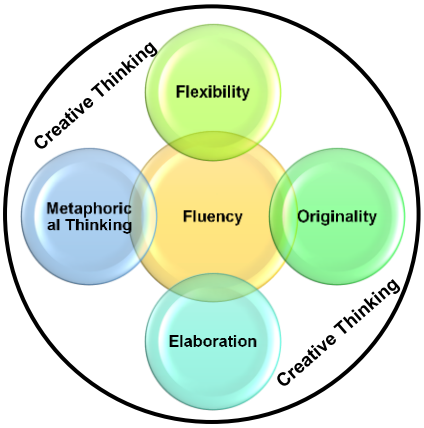

Figure 3. Interrelationship Between Creative Thinking Indicators

Figure 3 shows that the indicators of creative thinking skills including flexibility, originality, elaboration, and metaphorical thinking form a pattern around the fluency indicator. These four indicators are intertwined with the fluency indicator which indicates that these indicators contribute to each other in creating the fluency indicator. When a student is able to create and develop new ideas with various variations and from various perspectives, the student has fulfilled the flexibility indicator. The flexibility that students have is able to lead students to fluency in creating innovative new ideas. The originality of ideas generated by students and the ability of students to add or develop (elaboration) ideas will also lead students to fluency to argue and come up with new ideas that are different from most in solving a problem. In addition, the metaphorical thinking indicator will also lead students to fluency in making new analogies and connections to something. This statement indicates that when someone has achieved all four indicators of creative thinking ability which includes flexibility, originality, elaboration, and metaphorical thinking will lead them to the fluency indicator. When one of the indicators has not been met, it means that someone has not been able to master this ability and someone has the possibility of having mastered the fluency indicator but has not fulfilled one of the other indicators. This person is still said to have reached the fluency indicator, but has not been able to achieve several other abilities that might affect the aspect of conveying ideas and ideas. Overall, the five indicators of creative thinking ability must be owned and fulfilled by students because these five indicators will be interrelated with one another. This is reinforced by a statement from Torrance (1966), that aspects of creative thinking ability support the fluency of creative thinking, someone who has flexibility, originality, elaboration and tends to be more fluent in generating ideas. In addition, Treffinger et al (2002) revealed that creative thinking includes a process that involves divergent and convergent thinking skills simultaneously. The model supports the finding that flexibility, originality, elaboration and metaphorical thinking are important factors that shape fluency in creative thinking. When people master all four aspects of creative thinking, they are better able to think fluently and innovatively.

CONCLUSION AND RECOMMENDATION

The integration of the socio-scientific issue approach with the discovery learning model in science learning has a significant impact on improving students' creative thinking skills marked by an increase in students' scores in the post-test. The trend pattern shows that not all students were able to fulfill all indicators, but the majority experienced positive developments after the application of the discovery learning model. Overall, the discovery learning model integrated with the SSI approach is effective in improving students' creative thinking skills, especially in terms of flexibility of thinking and originality. Based on the research results, there are several recommendations that can be applied in science learning. First, the integration of socio-scientific issue approach with discovery learning model needs to be implemented more in science learning because it is proven to improve students' creative thinking skills. Second, as a support for science learning with this strategy, it is also necessary to develop interactive and interesting learning media such as educational videos, digital simulations, and project-based experiments. Third, it is necessary to improve students' elaboration skills by providing more practice in developing ideas and expanding concepts that students have learned. Fourth, further research is needed to identify factors that cause some students to experience difficulties in learning science with a discovery learning model integrated with a socio-scientific issue approach and to see the effectiveness at various levels of education.

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