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The Effect of STEM Learning in Building Creative Dispositions and Creative Thinking Skills of Junior High School Students

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Abstract: Education in the 21st century, students need to be equipped with life skills, one of which is creative thinking skills. Creative thinking skills cannot be separated from creative dispositions or what can be called creative character and habits. This study aims to determine the effect of using the STEM learning approach in building creative dispositions and creative thinking skills of junior high school students. The research design used was Nonequivalent control group design and the sampling technique was random sampling method. The independent variables of the research are the STEM learning approach (experimental class) and the scientific learning approach with verification practicum methods (control class). The dependent variable of the research is creative disposition and students' creative thinking skills. Data on students' creative dispositions were obtained from a creative disposition questionnaire while data on students' creative thinking skills were obtained from tests of creative thinking skills which were compiled based on indicators of creative thinking skills. Hypothesis testing in this study used the ANACOVA test. The results of the research on students' creative dispositions obtained the value of Sig. (α) = 0.000 <0.05 while creative thinking skills obtained Sig. (α) = 0.005 < 0.05. The results of the study showed that students who were taught using the STEM learning approach were better than students who were taught with a scientific learning approach using the verification practicum method.

Keywords: Creative disposition; Creative Thinking Skills; Scientific Learning Approach Verification Practicum Method; STEM Learning Approach.

Introduction

Education is an effort made to prepare students to develop their potential, abilities and talents. According to Undang-Undang RI (2003) no 20, concerning the National Education System Article 1 paragraph 1 it states that "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, as well as the skills needed by himself, society, nation and state.

The world of education is currently faced with the demands of life in the 21st century. Life in the 21st century is marked by the use of information and communication technology in all aspects of life, including in the world of education. Schools as educational institutions are required to find ways for students to have creative thinking, critical thinking, communication, and collaboration or what is commonly referred to as 4C (Septikasari & Frasandy, 2018). Learning must develop innovation by combining various thinking skills to be able to train children to have the ability to solve problems, communicate and collaborate, and think creatively.

Natural Sciences is a group of compulsory subjects in the secondary school curriculum structure. Learning Natural Sciences is related to how to systematically find

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out about nature so that science is not only mastering a collection of knowledge in the form of facts, concepts or principles but also the process. (Rustaman, 2007). Science education directs students to gain a deeper understanding of the natural world around them (Zubaidah, 2010). The approach used in conveying science learning needs to combine experience of the science process and understanding of science products in the form of direct experience (Liliasari et al., 2016). Learning activities that apply creative thinking skills can produce something new either in the form of ideas or real work so that they can apply innovative learning (Sukmawijaya et al., 2019).

Creative thinking develops a divergent mindset (Liliawati, 2011). Creative students will bring up new discoveries even if they use something that already exists (Rukamana et al., 2020). Creative thinking is a process used to generate new ideas, discover the value of evidence-based reasoning, enhance high-level cognitive skills, and be able to solve problems (Sukarso et al., 2019). Creative thinking skills are thinking skills possessed by a person by using various mental operations, namely fluency, flexibility, originality, and detailing according to (Torrance, 1977).

So far, studies on creative thinking skills have rarely been associated with creative dispositions, even though creative dispositions and creative thinking skills cannot be separated, so they are analogous to two sides of a coin that complement each other (Widodo, 2015). Creative disposition describes a person's pattern of behavior without coercion (Sukarso et al., 2019). Creative dispositions as Habits of Mind (HOM) or one's thinking habits (Widodo, 2015), is a person's tendency to think and do something under conscious control and voluntarily orientated towards a specific broader goal (Permanasari et al., 2021). Creative disposition includes 5 dimensions namely inquisitive, persistent, imaginative, collaborative, disciplined (Lucas et al., 2013). The potential of students' creative dispositions is important as a perspective for developing students' creative learning in biology learning (Sukarso et al., 2019).

Creative dispositions and creative thinking skills can be developed using appropriate learning approaches, models or methods. The application of an authentic research project practicum learning model has been proven to encourage the development of students' scientific creativity and teach students research skills (Sukarso & Muslihatun, 2021). The implementation of STEM in learning in schools prepares students to acquire critical, creative and innovative thinking skills in solving problems and making decisions as well as being able to communicate and collaborate (Izzati et al., 2019), so as to create human resources (HR) that are globally competitive (Kholifah et al., 2018). STEM learning from home with the PjBL model can improve students' mastery of concepts and creative thinking skills (Ningrum et al., 2021), improve the ability to analyze, evaluate and ultimately be able to bring out the creativity of students (Cahyani et al., 2020), make students active in interacting with the surrounding environment so that students are able to know the processes and symptoms related to science (Nurya et al., 2021). STEM is an interdisciplinary approach that can increase student creativity (Khairiyah, 2019).

Integrating STEM into learning to foster students' creative dispositions is still rarely done, even though creative dispositions will ultimately improve students' creative thinking skills. Therefore, research with a STEM learning approach to foster creative dispositions is important in order to obtain what kind of student learning activities can foster students' creative dispositions. Thus, developing creative thinking skills must be built through developing creative dispositions.

Method

This research was conducted on class VII students of SMPN 3 Boawae NTT Even Semester for the 2022/2023 academic year. The research subjects totaled 50 students which were divided into 25 students in the experimental class and 25 students in the control class. The selection of research subjects was determined using a random sampling technique. The research design uses a nonequivalent control group design that applies a STEM learning approach to the experimental class and a scientific learning approach with verification practicum methods to the control class.

Table 1. Research design

Groups	Pre-test	Treatment	Post-test
Experiment	O_1	X_1	O_2
Control	O_3	X_2	O_4

Note:
O_1: Giving initial tests to the experimental class before being given treatment; O_2: Giving the final test to the experimental class after being given treatment; O_3: Giving initial tests to the control class before being given treatment; O_4: Giving the final test to the control class after being given treatment; X_1: Treatment with a STEM learning approach; and X_2: Treatment with a scientific learning approach verification practicum method.

Table 2. STEM Approach Syntax and Verification Practicum

STEM approach	Verification Practicum
Observe	Practical introduction
In this step, students are motivated to make observations on phenomena/issues in the everyday environment that are related to the science concepts being taught.	Students identify the problems presented by the teacher to find out the answers.
New Idea	Practical core
In this step students observe and seek additional information about various phenomena or issues related to the subject topics discussed, then students design new ideas from existing information. In this step students need the skills to analyze and formulate information.	Students in groups discuss material based on student worksheet. Students carry out practical investigations with the guidance of the teacher. Students answer
Innovations	
In the innovation step students are asked to describe things that have been designed in the new idea step that can be applied in an experimental tool.	questions on student worksheet. Practical cover
Creativity	Students present the results of their
This step is the implementation of all of the results in the new idea step.	group discussions. Students analyze
Society	the answers of each group, and draw
This step is the last step carried out by students, which means the value possessed by the ideas generated by students for social life.	conclusions from the material being studied.

Research data were collected using a creative disposition questionnaire, creative thinking skills test, and creative product assessment sheets. The creative disposition questionnaire is used to measure student character and determine the position of students' creative disposition compared to their peers. Types of questionnaires with closed answer types using a Likert scale of 1-5 with for each creative disposition parameter, namely: Always, Often, Sometimes, Rarely, Never. Creative dispositional position parameters include: Much Higher, Higher, Same, Lower, Much Lower. Creative dispositions and creative disposition positions are expressed in the inquitive, persistent, imaginative, collaborative, disciplined dimensions referring to Lucas *et al*. (2013). The creative thinking skills test is measured by giving a test in the form of an essay with 5 questions, compiled and developed by researchers on environmental pollution material. The questions used were tested for validity and reliability with a reliability level of 0.694 in the high category (Riduwan, 2012). The test questions were developed referring to Torrance's Test of Creative Thinking (TTCT) (1977), including fluency (related to the number of logical ideas generated), flexibility (related to the various types of ideas generated), originality (related to generating unique and new ideas).), elaboration (related to the details of the ideas produced). The scoring of the test results was carried out based on the rubric of creative thinking skills made by the researcher. Assessment of students' creative products was only carried out in the experimental class because the control class did not produce any products. Assessment of students' creative products uses a creative product assessment rubric which includes novelty, resolution, elaboration and synthesis, referring to the indicators set by Besemer & Treffinger (1981). Creative disposition questionnaires, creative disposition position questionnaires, and creative thinking skills tests were given to both classes before and after the intervention.

The research data are in the form of quantitative data, namely the pretest and posttest scores of the creative disposition questionnaire and the creative disposition position questionnaire on a scale of 1-5 with the acquired values converted on a scale of 1-100 and categorized according to Table 3. Data on creative thinking skills in the form of quantitative data on skills pretest and posttest scores creative thinking which is given a score of 0-3 for each question, then the total score is converted to a scale of 1-100 and categorized as Table 4. Data on students' creative disposition and creative thinking skills that have been collected are then analyzed statistically parametrically with the Analysis of Covariance test (ANACOVA) using SPSS version 25.

Table 3. Qualification Level Category Creative Disposition and Creative Position of Students

Conversion scale 100	Qualitative categories creative disposition	Position category creative disposition
$90 < x \leq 100$	Very high	Way above
$80 < x \leq 89$	Tall	On
$65 < x \leq 79$	Average	Average
$55 < x \leq 64$	Low	Under
$0 < x \leq 54$	Very low	Far below

Source: (Sukarso, 2019).

Table 4. Criteria for Assessment of Creative Thinking Skills

Scale	Interpretation
81 – 100	Very good
61 – 80	Good
41 – 60	Enough
21 -40	Not enough
0 – 20	Very less

Source: (Riduwan, 2012).

Result and Discussion

The Effect of Applying the STEM Learning Approach to Increasing Creative Dispositions

The results of the research and data analysis on the creative dispositions of the experimental class and control class students are summarized in Table 5. Based on Table 5, the initial creative dispositions of students in both classes were the same and increased significantly in both the experimental class and the control class.

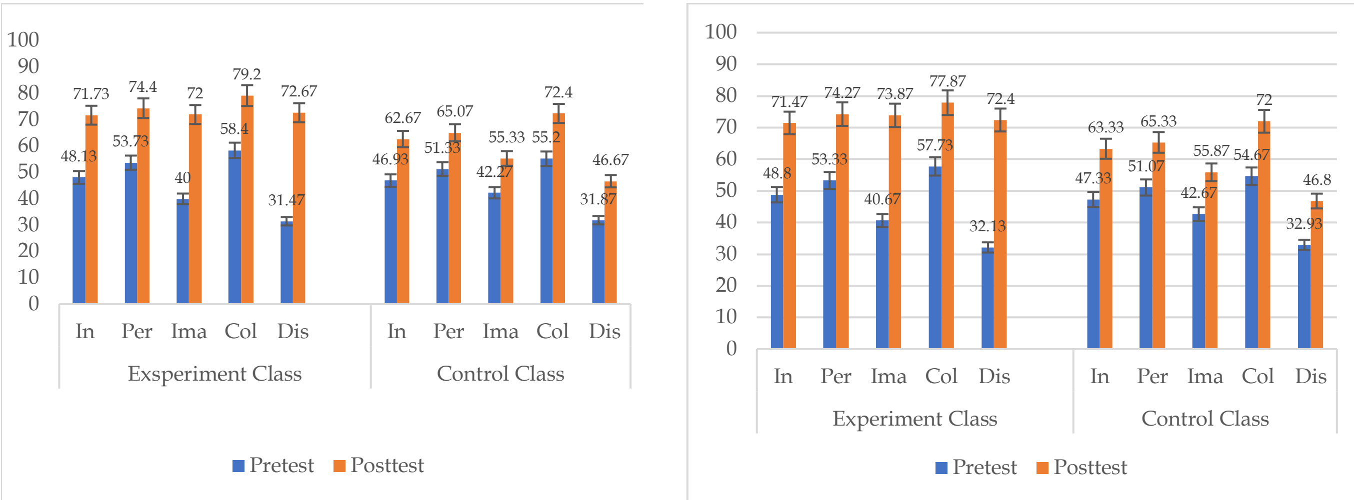
The pretest and posttest values of both classes had normal data distribution, homogeneous data variation (Sig. > 0.05) and linear data (Sig. <0.05). The results of hypothesis testing with Analysis of Covariance (ANACOVA) obtained that the Estimated Marginal Mean value of the experimental class (73,866) was greater than the control class (60,562). The results of the ANACOVA test on the learning approach (Sig. = 0.000) are less than (α) 0.05 so that the application of the STEM learning approach has a significant effect on the posttest scores of students' creative dispositions. The increase in creative disposition and the creative disposition position of each domain is presented in Figure 1.

Table 5. Recapitulation of Pretest and Posttest Scores, and Statistical Test of Creative Disposition

Component	Class of Experiment		Class of Control	
	Pretest	Posttest	Pretest	Posttest
The number of students	25	25	25	25
		74.00	45.52	60.43
Average score		5.696	6.187	7.063
	46.35			
Standard Deviation		58.00	36.00	48.67
	6.366			
Minimum Score		84.67	59.33	74.67
Maximum Score	36.00	0.335	0.305	0.305
		(Normal)	(Normal)	(Normal)
Test		0.144	0.865	0.144
Normality	59.33	(Homogen)	(Homogen)	(Homogen)
		0.038	0.038	0.038
Homogeneity Test		(Linear)	(Linear)	(Linear)
Test	0.335			
Linearity	(Normal)			
	0.865			
	(Homogen)			
	0.038			
	(Linear			
ANACOVA test and pretest scores posttest class creative disposition experimental and control class (α = 0.05)	Estimated marginal mean of experimental class (73.866) > control class (60.562), Sig.= 0.000 < 0.05. H0 is rejected.			

Based on the research data above, the STEM approach intervention has a significant effect on students' creative dispositions. This is in line with previous research by Sukarso et al. (2019) the application of a practicum learning model based on creative research projects has a positive effect on increasing students' creative dispositions. In the experimental class, the increase in the five domains is in the average category. In the control class, the persistent and collaborative domains are in the average category, the inquitive and imaginative domains are in the low category, and the disciplined domain is in the very low category. Data on students' creative dispositions in this study are in line with the position of students' creative dispositions compared to their colleagues. This means that after carrying out STEM learning activities, students feel more confident in the position of creative disposition so that the results raise self-confidence in students compared to verification practicum learning.

It can be concluded that the application of STEM learning can trigger students' creative dispositions. The results of this study indicate that the experimental class is more developed in the character of curiosity after carrying out the observe syntax. Observation activities in the STEM learning approach are optimized by students making observations of phenomena that occur in the everyday environment that have a relationship with the material being taught, allegedly to stimulate students' curiosity characters. The observation phase is very useful for fulfilling students' curiosity so that the learning process has high significance and can increase student learning motivation to find out more about the subject matter (Papilaya, 2015). Research by Pluck & Johnson (2011) explained that active learning models such as PBL can stimulate students' curiosity, so students are able to solve a problem, students will feel satisfied so they will find out more information. Besides that, research Silmi & Kusmarni (2017) explained, the use of interesting media in learning is also quite effective in fostering students' curiosity. Watson (2017), states that people with curiosity are very active to ask questions. Students ask to be able to increase their cognitive knowledge and are usually not limited to a particular subject. Based on a study conducted by Bardone & Secchi (2017), that curiosity has a positive effect on the number of problem solving generated.



(a) (b)

Figure 1. Comparison of each creative disposition domain of the experimental class and the control class; (a) creative disposition, (b) creative disposition position. In= Inquitive, Per=Persistent, Ima=Imaginative, Col=Collaborative, Dis=Disciplined

The application of the STEM approach in the new idea syntax is optimized with the student phase designing new ideas from information obtained through observation and applying these ideas into a product. Students need the skills to analyze and formulate the information that has been obtained. Students can discuss with a larger scope students will practice so they have the courage to exchange opinions to determine possible answers or solve problems together with other students. Study Graham et al. (2013), states that the application of active learning which includes activities that emphasize students' thinking activities, analyzing, and solving problems can increase students' tenacity and persistence. Research result Robson & Rowe (2012), also indicates that the persistent and tenacious character of students appears efficiently in activities that free students to empower their learning resources and knowledge, besides that interaction with peers can make students more courageous in engaging in challenging activities such as discussions in learning. In addition, teacher support and direction in the student learning process is still needed.

The application of the STEM approach in the syntax of innovation and creativity which is optimized with a good performance phase in the form of student discussions in outlining various thoughts that have been designed in new idea steps that can be applied in a product. Students also discuss generating solutions and the possibility of imagination in designing ideas that have been made and creating product designs. Discussion activities give students the freedom to empower their thinking and use intuition, link their knowledge with the results of data collection to propose possible answers that can train students' imaginative character. Hadzigeorgiou (2016) argues that there are several activities that can be carried out to improve students' imagination abilities, such as conducting an investigation of a phenomenon or problem, keeping a journal, providing various questions that can link students' facts and ideas, combining a science learning approach with making products. Murphy (2022), states that when going through a discussion someone will use their imagination in the form of a statement and when trying to understand a phenomenon, someone will explore with their own imagination to find out the elements that exist in that phenomenon.

The application of the STEM approach in syntax, namely innovation and creativity which is optimized with students discussing describing and designing designs and applying them to a product, students also reflect on themselves and their creations in developing these products, this can increase the character of cooperation. In the syntax, innovation and creativity are carried out by working together in groups by discussing. These activities provide space for students to exchange answers and various kinds of ideas or opinions. Likewise, students can communicate their creations in making products by exchanging and providing input to LKPD in groups which will also train the character of student cooperation. Group discussion activities can provide opportunities for students to practice adapting how to work together on a smaller or larger scope. Arrosid et al. (2019) argues that learning that emphasizes student activity in groups, can train student cooperation to build knowledge and achieve learning goals. Study Susetyarini et al. (2022) states that problem-based learning is able to improve students' cooperative skills.

Application of the STEM approach in the syntax of society. In the society syntax, students have tried to develop techniques in making products and then students reflect on and apply the benefits of these products for learning and the surrounding environment. Students can focus more on solving problems besides that students also understand more about the correct steps to carry out investigations and apply them to social life. Students also present their work so as to increase their sense of pride in their work, correct mistakes and ensure that work is done properly as it should. Through these activities students can realize the weaknesses or strengths of the results of their investigations to be improved or corrected. Jung et al. (2017) states that self-efficacy (self-assessment) is the beginning of the character of knowledge mastery. Self-efficacy makes a person understand his strengths and weaknesses, as a motivator to achieve goals and increase the achievement of higher success. Self-efficacy is related to the ability to make decisions for the mastery of knowledge.

The Effect of Applying the STEM Learning Approach to Increasing Creative Thinking Skills

The results of the research on the application of the STEM learning approach and verification practicum in improving creative thinking skills are presented in a concise form as Table 6.

Table 6. Recapitulation of Pretest and Posttest Scores, and Statistical Test of Creative Thinking Skills

Component	Class Experiment		Class Control	
	Pretest	Posttest	Pretest	Posttest
The number of students	25	25	25	25
Average score		62.40	37.60	55.20
Standard Deviation	36.00	12.748	8.363	9.722
Score	6.667			
Minimum		40.00	26.67	40.00
Maximum Score	20.00			
Test		80.00	60.00	73.33
Normality	46.67			
Homogeneity Test	0.096	0.096	0.162	0.162
Test	(Normal)	(Normal)	(Normal)	(Normal)
Linearity	0.275	0.089	0.275	0.089
	(Homogen)	(Homogen)	(Homogen)	(Homogen)
	0.001	0.001	0.001	0.001
	(Linear)	(Linear)	(Linear)	(Linear)
ANACOVA test and pretest scores posttest thinking skills creative experiment class and control class (α = 0.05)	*Estimated marginal mean of experimental class (62.995) > control class (54.605), Sig.= 0.005 < 0.05. H0 is rejected.*			

The results of this study indicate that students in the STEM learning approach class have better creative thinking skills than students in the verification practicum learning class. Based on these results, there is a significant difference in creative thinking skills between the two classes after being given learning. The results of testing the hypothesis with the ANACOVA test obtained that the Estimated marginal mean value of the experimental class (62,995) was greater than the control class (54,605). After being given the intervention, students in the STEM learning approach class showed a significantly greater increase than the verification practicum learning class. The results of the ANACOVA test obtained (Sig. = 0.005) less than (α) 0.05 so that the application of the STEM learning approach had a significant effect on the posttest scores of students' creative thinking skills.

Creative thinking skills reflect a creative disposition because the results of a good disposition can affect the results of good creative thinking skills. The disposition or character of people who think creatively consisting of curiosity, persistence, imaginativeness, cooperation, and mastery of knowledge can trigger students to have creative thinking skills which are skills of creative people which include thinking fluently, thinking flexibly, thinking original and thinking in detail. Having good character can also trigger good skills, so that creative thinking skills are closely related to creative dispositions. This is in line with research conducted by (Sukarso et al., 2022) which indicates that an increased creative disposition also increases creative thinking skills. Creative dispositions and creative thinking skills cannot be separated so that they are analogous to two complementary sides of a coin (Widodo, 2015).

These findings explain that the STEM learning approach can trigger the development of students' creative thinking skills, where students carry out several activities that are considered to improve fluency, flexibility, originality, and elaboration skills. Student activities in STEM learning through the syntax observe, new idea, innovation, creativity, and society. In this research, students have demonstrated active learning activities driven by STEM syntax where students can produce creative products. Other research using the STEM approach causes students to be active in their learning. For example, the application of STEM-based worksheets based on the STEM approach is effective in training students' creative thinking skills (Agustina et al., 2021), model pembelajaran project based learing (Sukarso et al., 2019; Wijayati et al., 2019), the application of augmented reality media can train students' creative thinking skills. An overview of improving students' creative thinking skills in every aspect of fluency, flexibility, originality, and elaboration is presented in Figure 2.

The application of the STEM learning approach in this study specifically shows its main impact on increasing each aspect of fluency, flexibility, originality, and elaboration which is higher in the experimental class than the control class. Aspects of fluency, flexibility, originality respectively (66.67), (62.67), (65.33) are in the good category, while the elaboration aspect is (50.67) in the sufficient category (Riduwan, 2012). In the control class, the increase in fluency, flexibility, originality, and elaboration aspects was (60.00), (56.00), (48.00), and (42.67) respectively in the sufficient category (Riduwan, 2012).

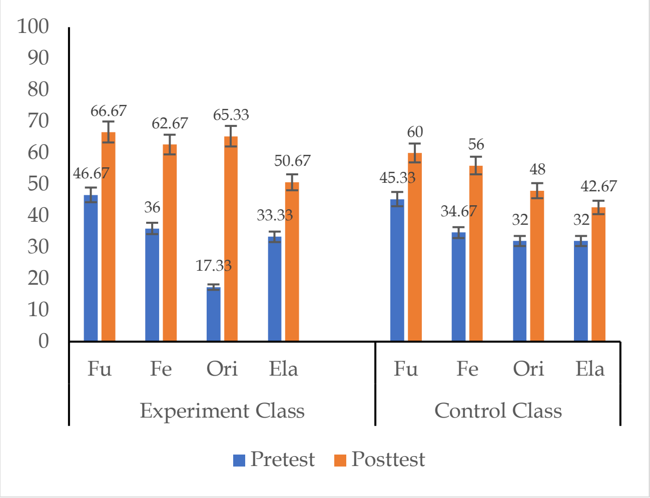


Figure 2. Comparison of each aspect of students' creative thinking skills. Fu=Fluency, Fe=Flexibility, Ori=Originality, Ela=Elaboration

The syntax for the STEM learning approach in the observe and new idea stages, both of which are optimized with a good performance phase, is thought to be the cause of the development of the ability to think fluently. The observe syntax contains student observation activities on phenomena related to environmental pollution material. These activities will stimulate students to foster curiosity and generate ideas in determining learning objectives. Meanwhile, in the new idea syntax which is carried out by means of group discussions, students seek additional information about phenomena related to learning and analyze the information that has been obtained. This activity gives students the opportunity to suggest answers that come to mind. Research by Fatmawati et al. (2022) that the application of the creative problem solving based learning model indicates a significant influence on students' fluent thinking.

Flexibility describes a person's ability to overcome obstacles, by formulating various ways to overcome a problem (Torrance, 1977). The STEM learning approach seems to be able to stimulate students' minds to think flexibly (Putri et al., 2016). Through the innovation syntax students are asked to describe things that have been designed in a new idea step that is applied in an experimental tool. Students are required to make analyzes with a variety of flexible ideas with discussions in student groups to determine development to produce creative products. Syntax innovation is thought to increase flexible thinking. In this syntax, students are also guided to make a more detailed description of the product manufacturing plan regarding the focus of product manufacturing, product benefits, as well as the tools and materials needed during the product manufacturing process. study Kholifah et al. (2018) explained that STEM learning can improve aspects of flexible thinking, because STEM learning has a positive effect on stimulating students' mindsets to produce different ideas to solve problems. In addition, research by Mahanani et al. (2017) indicates that the application of problem based learning can improve the ability to think flexibility and elaboration. Study Nurisalfah et al. (2018) that students' flexible thinking is sufficient after students are trained to plan projects.

Originality is a person's skill in producing new ideas (Kusumawati et al., 2018). Study Sannomiya & Yamaguchi (2016) explained that listening to the presentation of ideas produced by others has the potential to practice creative thinking skills. Exposure of ideas conveyed by others can stimulate the production of their own ideas. The results of his research revealed that many of the ideas he generated were influenced by the ideas of other people he had heard. So that the more students hear the presentation of other people's ideas, the more they produce various ideas. Studies conducted by Agogué et al. (2014) also indicated a similar thing, that participants who heard many examples of unique ideas could produce more original ideas than students who were exposed to general ideas. The syntax of the STEM approach, namely creation that is optimized with the good performance phase of students in carrying out the process of making products into creative products that can overcome problems related to the material. Students can also discuss and develop their original creative ideas so as to increase the originality aspect. This syntax is carried out with discussion activities and group work to produce products, making students free to give opinions to answer problems.

Elaboration is the ability to develop, enrich or expand an idea that has been made so that it becomes more detailed (Munandar, 2009). The syntax of the STEM learning approach, namely society that is optimized with the good performance phase of students in describing and explaining the value possessed by ideas in the form of creative products produced by students for social life. Students can practice making detailed schematics/descriptions regarding benefits and efforts to overcome problems, planning and relationships between problems, results of data analysis and conclusions in accordance with the material being taught so that students practice detailed thinking skills. Research result Octavia (2016) and Amirullah et al. (2021) explains that the application of mind mapping-based learning has a significant influence on improving students' detailed thinking skills. Mind mapping can help students make a more concise picture of their creative ideas and help students see problems from a broad perspective.

Student Creative Products

Creative product assessment as a product of STEM learning activities is carried out in the experimental class. Practicum activities in the control class only put theory into practice so that no product is produced. All of the products produced are related to ecobrick products that come from used bottles and plastic materials that are in the school environment and students' home environment. The average value of creative products for each group is known to be 74.29% belonging to the good category (Riduwan, 2012).

Figure 3 shows the results of students' creative products after implementing the STEM learning approach for the experimental class. The results of the novelty research were classified according to Riduwan at 80%, resolution at 72%, for synthesis & elaboration at 73.33%. There are three novelty criteria, namely original, germinal, and transformational and these criteria are contained in student products. Most creative novelties must be considered from the experience of their creators (Munandar, 2009). In a scientific context, novelty is related to an understanding of nature. Most of the student products have met the resolution dimension which has three criteria, namely adequate, appropriate, useful, and logical. Students' creative products can answer needs, provide solutions, and can be accepted according to the science disciplines students are studying. The synthesis & elaboration dimension allows students to improve students' abilities to combine various elements of good skill performance and to do it carefully (Munandar, 2009).

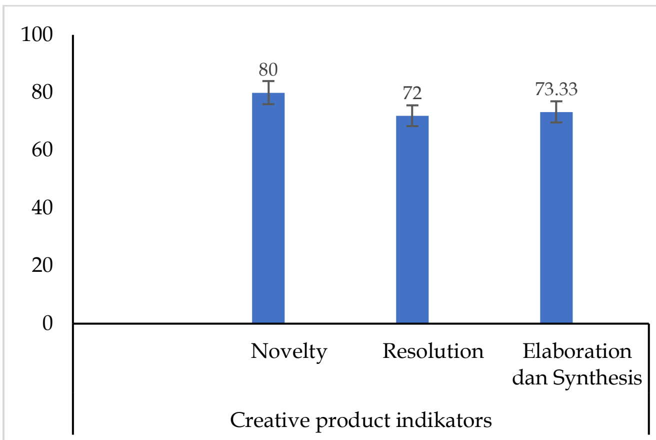


Figure 3. Average creative product indicator score

The products made by each group are ecobricks of different types. Group 1 and group 2 made plastic benches from ecobrick and group 3 and group 4 made plastic flower pots from ecobrick. Products made in groups using materials that are easy to find in the surrounding environment. Students take advantage of plastic waste and process it into a product that is more useful, students indirectly protect the surrounding environment so that environmental pollution does not occur according to the material being taught. STEM learning provides opportunities for students to construct their own knowledge and reach its peak by producing real products.

Conclusion

The results of this study concluded that the STEM learning approach could trigger the growth/emergence of students' creative dispositions in science subjects, increasing students' creative dispositions in a better direction even though they were still in the average category and the highest dispositions were in the collaborative and persistent domains. Students' creative thinking skills also increased, belonging to the good category, especially in terms of fluency and originality in environmental pollution material. Creative products produced from the STEM learning approach are ecobricks belonging to the good category.

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Author Contribution
Maria Rosalinda Febrianti Sawu; introduction, methodology, data analysis, discussion, conclusion. AA Sukarso, Tri Ayu Lestari, and Baiq Sri Handayani; do proofreading and review and validation.

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Conflicts of Interest
The author declares that there is no conflict of interest regarding the publication of this article.

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