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The effect of Google Classroom assisted STEM approach on students' creative thinking skills

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ABSTRACT

Low creative thinking skills, the approach used in learning has not facilitated students to understand problems and express many ideas. The purpose of this study was to determine the effect of the Google Classroom-assisted STEM approach on creative thinking skills. This study used a quantitative research type with Quasi-Experimental Design. The population in this study were all students of class VIII SMP Negeri 20 Bandar Lampung, with a sampling technique that is cluster random sampling obtained Class G as the experimental class and H as the control class. Hypothesis testing using the Independent Sample T-test which was preceded by a prerequisite test for normality and homogeneity of the data. The results of the t-test hypothesis test obtained a significance of 0.00 <0.05, meaning that H0 is rejected so that it can be concluded that the STEM approach assisted by Google Classroom has an effect on students' creative thinking, with the acquisition of each indicator, namely 79.7% originality indicator, 80.7% flexibility, 82.0% elaboration, and 81.2% fluency, this increase can be seen from the impact on students becoming more enthusiastic by motivating each other among friends through creative thinking so that they are able to make decisions and solve problems well.

INTRODUCTION

Education is very important to grow life skills through the integration of attitudes, knowledge and abilities. In the era of the industrial revolution 4.0, students are required to have creative, critical thinking, collaboration and communication skills (Andrini, 2016; Suwardana, 2018). Creative thinking skills are essential abilities in the 21st century (Gunawan et al., 2018), because the level of complexity of problems in all aspects of modern life is very high, these skills are included in the high-level cognitive domain as a continuation of important competencies in the learning process (Hasan et al., 2019), this skill is not innate, but must be built and honed through observation and collaboration (Mashudi, 2021) which allows the generation of new ideas (Srikoon et al., 2018) so that they can manage information for problem solving and even develop divergent thinking (Antink-Meyer & Lederman, 2015) these skills are able to give birth to a creative generation that has the potential to provide solutions to social problems and environmental issues, develop innovations, find concepts independently that have an impact on good learning achievement (Salamiyah & Kholiq, 2020), so that this skill is important for students to have.

Facts on the ground show that creative thinking skills are still low, this is based on the results of pre-research conducted on class VIII SMPN 20 Bandar Lampung students showing that every indicator of creative thinking is included in the low category, one of the contributing factors is that the approach used has not facilitated students to understand problems and express many ideas, while the media used did not support learning during the COVID-19 pandemic, as a result students were less motivated in learning, students only listened to explanations from educators and were accustomed to convergent thinking which had an impact on the difficulty of thinking creatively in solving problems. Students' creative thinking skills cannot develop properly if there is no interaction in learning (Nuranggraeni et al., 2020). The key to effective learning is the teacher's teaching method which allows the active involvement of students in learning (Handayani et al., 2018), one of the alternative solutions to develop creative thinking skills is the STEM approach.

The STEM approach integrates science, engineering, technology, and mathematics which can enhance 21st century skills (Kelley & Knowles, 2016; Octapani & Hamdu, 2020), this approach is able to train students to hone cognitive, explore creativity, innovation, manipulative, affective (Dare et al., 2018) develop knowledge, answer questions based on observation or reasoning, and can help to generate new ideas (Davidi et al., 2021) through discussion this approach is able to make students more active in thinking, solving problems, interacting, and exploring the knowledge they have (Ariani et al., 2019) so that students can find solutions to solve problems and be able to communicate them well. Learning that uses the STEM approach allows for an increase in the quality of learning, motivation and interest of students (Septiani et al., 2020). Learners do not just focus on cognitive aspects, but understand the concepts and interrelationships of scientific processes in life. This approach was developed to generate meaningful learning through the systematic integration of knowledge, concepts, and skills (Sumarni et al., 2019), several research results show that the STEM approach can increase scientific literacy (Ismail et al., 2016; Khaeroningtyas et al., 2016) critical thinking (Onsee & Nuangchalerm, 2019; Ritonga & Zulkarnain, 2021), higher order thinking, problem solving and able to increase the motivation and achievement of students.

The government issued regulations to suppress the spread of COVID-19 related to education, namely teaching and learning activities at schools were replaced with learning at home. The COVID-19 pandemic has changed the pattern of learning that should be offline to online (Alfiah et al., 2020), so you need media that can be used online, one of which is Google Classroom. Google Classroom is a platform that is easily accessible, flexible, and can be applied in online learning activities (Heggart & Yoo, 2018; Sukmawati & Nensia, 2019), this media is able to replace offline learning into online which can be used as a solution in the current pandemic situation (Sartika, 2021) which can foster self-confidence, namely students can write down their ideas in the Google Classroom without embarrassment and can interact with students, so that they feel they are an

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active part of learning because they are integrated with their social involvement (Shahroom & Hussin, 2018).

Google Classroom can create a new learning environment for students and educators will not meet each other directly, so that it can trigger students to ask further questions about lessons through the application, besides that this media makes it easier for educators to be creative and organize assignments, feedback, and communication in the classroom (Shaharanee et al., 2016). The purpose of this study was to determine the effect of the Google Classroom-assisted STEM approach on creative thinking skills. This research will compare the improvement of creative thinking skills using the STEM approach assisted by Google Classroom with the teacher centered approach, previous research conducted by (Wahyunita & Subroto, 2021) about the effectiveness of the blended learning model (google classroom) with the stem approach in an effort to improve skills only in critical thinking not creative thinking skills.

METHODS

This research was conducted at SMPN 20 Bandar Lampung. The research method used was a quasi-experiment with a posttest only control design. This study gave treatment to two classes, namely the experimental class using the STEM approach assisted by Google Classroom with steps observe, new idea, innovation, creativity, and society. and the control class uses a teacher centered approach. The independent variable used is the Google Classroom-assisted STEM approach while the dependent variable used is creative thinking skills, with indicators according to (Corebima et al., 2017) namely Originality, Flexibility, Elaboration, and Fluency.

The population used in this study were all ten grade VIII students of SMP Negeri 20 Bandar Lampung. The sampling technique uses a random class. The data collection method is a test with an instrument in the form of an essay test which is preceded by a validity test, reliability test, discriminating power test, and difficulty level test. Hypothesis testing was carried out using the t test with the probability variable below the 5% confidence level using SPSS version 22 which was preceded by prerequisite tests for normality and homogeneity.

RESULTS AND DISCUSSION

Based on the research that has been carried out, the results obtained in the data normality test using the Kolmogorov-Smirnov data are normally distributed, namely sig (0.200) > 0.05 in the experimental class and in the control class sig (0.082) > 0.05, it can be concluded that H0 for both classes is accepted. The homogeneity test using Levene test obtained data Sig (0.87) > 0.05, so it can be concluded that H0 is accepted, which means that the variants of the two classes are homogeneous. because the prerequisite test met the criteria, namely normal and homogeneous data, then it was continued with hypothesis testing, namely the independent sample t-test test, obtained sig data (2 tailed) of 0.000 <0.05, meaning that H0 was rejected so that it could be concluded that there was an influence of the STEM approach assisted by Google Classroom on creative thinking skills, this is supported by the posttest average value data for the experimental class, which is 80.95, which is higher than the control class, which is 72.29.

The results of the percentage indicators of creative thinking skills in the control class are lower than those in the experimental class presented in Table 1.

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Table 1. Percentage indicators of creative thinking skills.

No	Indicator	Percentage (%) of Skill Achievement in Class	
		Experiment	Control
1	Originality	79,7	62,2
2	Flexibility	80,7	72,5
3	Elaboration	82,0	68,7
4	Fluency	81,2	75,6

Based on Table 1 in the experimental class that uses the STEM approach assisted by google classroom is able to influence the increase in each indicator of creative thinking skills because STEM is able to bring up students' thinking skills so that it is easy to solve problems related to everyday life, students are trained to be able to develop the nature of science Through the interrelationships between science, engineering, technology and mathematics, besides that, Google Classroom has the role of fostering an attitude of confidence in expressing their ideas so that creative thinking skills can be empowered because all students have the same opportunities, not limited in time as during offline learning, besides In addition, Google Classroom is a web or media that is easily accessible, flexible, and able to be applied in the teaching and learning process.

The first indicator, originality, is that the experimental class obtained a percentage of 79.7 while the control class obtained a percentage of 62.2. This indicator is the skill of students in expressing ideas or solving problems in ways that have never been thought of by others (Armandita et al., 2017), the acquisition of a higher percentage of scores in the experimental class compared to the control class proves the influence of the Google Classroom-assisted STEM approach which is able to facilitate students to find solutions to problems after reading and hearing ideas and also from the results of discussions. Problem analysis skills strengthen the existence of rational and logical studies on cognitive processes to obtain the necessary solutions or solutions, students become more enthusiastic by motivating each other between friends through creative thinking so they are able to make good decisions due to deep understanding processes, sharp analysis, and diverse thoughts (Davidi et al., 2021). The STEM approach enables increased experience and learning opportunities in developing existing knowledge and concepts, encouraging students to have a scientific attitude that is able to manage theoretical learning experiences integrated with factual conditions according to the learning context of students (Hassan et al., 2019), this is related to the STEM component, namely E (Engineering) is an understanding of technology development through a design process using project-based learning themes through the integration of various subjects (Ardianto et al., 2019). At this stage students are asked to write down ideas for technological designs that can be used to overcome problems related to the respiratory system. Some students write down the procedure for making simple nebulizers and simple oxygen concentrators, from this STEM process it is hoped that in everyday life they can practice making the tools they write on google classroom, this is in accordance with theory (Ariyatun & Octavianelis, 2020) that learning with problem patterns that are stimulated in students in various forms is able to motivate students to learn.

The second indicator, namely flexibility, is the skill to spark many ideas or ideas and connect them, as well as obtain many solutions to solve problems (Sister et al., 2020). In the experimental class, the percentage was 80.7, higher than the control class which was only 72.5. The experimental class that uses the STEM approach involves four aspects of forming knowledge about the subject so that it is easier to understand (Priyani & Nawawi, 2020). Students are given the freedom to express diverse ideas or ideas and be able to look at problems from different perspectives. In this study, the factors that influence flexibility, namely high habits and curiosity, can motivate students to interact directly (Irfana et al., 2019), so that students will easily remember the concept or knowledge they have, this is related to the STEM component, namely T (Technology) is knowledge of how new technology will be developed, and has the skills for how new technology affects

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society, and the state, nation, individual (Ardianto et al., 2019). At this stage, students observe videos provided through Google Classroom about how technology works in the respiratory system, namely tracheostomy technology, oxygen catheters (breathing tubes), pulmotors, spirometers (diagnostic tools for the lungs), and nebulizers (tools for asthma sufferers). Students discuss how to use technology and then relate it to respiratory problems. The insertion of technology in learning activities will help students think to seek and discover the concepts they are learning. The third indicator is elaboration, namely the skill of generating ideas or ideas in detail, students who have good creative thinking skills are able to store concepts in long-term memory and know the interrelationships of ideas they have, are able to develop ideas and explain an object or idea in more interesting detail (Sumarni et al., 2019). In this indicator, the experimental class obtained a higher percentage compared to the control class, namely 82 compared to the control class, which only received 68.7. This difference in percentage is because the class that uses the STEM approach is given the opportunity to explain causes and alternative solutions to solve problems (Arifin, 2020).

The STEM approach is able to make teaching and learning activities more meaningful because it integrates four fields of knowledge that are able to facilitate the development of students' skills in understanding the material and being active in solving problems (Ardiansyah et al., 2021), this approach does not only focus on cognitive, but students' interest in subjects can also be increased, so that the STEM approach has contributed to increasing indicators of creative thinking skills, namely elaboration, this is related to the STEM component, namely S (Science) is a person's skill in using knowledge scientifically, understanding nature, and participating in decision making (Ardianto et al., 2019), science in science learning leads to the mechanism of human breathing, at this stage students carry out independent experiments using balloons and aqua bottles related to the inspiratory and expiratory phases, from this experiment students are able to show the windpipe, chest cavity, lungs, and diaphragm in modeling the respiratory system and being able to explain the problems that occur when a balloon is pulled, released, or blown through a straw, this stage is able to train students to identify, formulate problems, hypothesize, make observations, and make conclusions.

The fourth indicator, namely fluency, is the skill of a person having many ideas or ideas to solve a problem (Indrayani et al., 2016). In the experimental class, a higher score was obtained, namely 81.25%, while in the control class, namely 75.6%, this was because in the STEM approach students were able to develop their imagination (Mardiyah et al., 2021), every aspect of STEM equips students to gain knowledge and develop thinking skills (Octaviyani et al., 2020), raises the involvement of students in a real context that creates a meaningful science learning process, students are active in thinking, behaving and behaving (Bujuri & Baiti, 2018), this is related to the STEM component, namely M (Mathematics) is a skill in analyzing problems or causes and communicating ideas effectively so that they are able to behave, formulate, and interpret solutions to mathematical problems in their application in various different situations (Ardianto et al., 2019). At this stage students learn the formula for total lung capacity, namely lung vital capacity and total lung volume, creative thinking skills can develop properly because educators guide students through Google classroom in thinking about mathematical problems in events that occur in relation to daily life, the role of google classroom allows students to learn peer to peer, namely discussing and exchanging ideas with various features that make it easier for educators and students.

The STEM approach assisted by Google Classroom has an effect on improving creative thinking skills, this is in line with research (Octaviyani et al., 2020) on improving students' mathematical creative thinking skills through the project-based learning model with the stem approach, namely an increase in students' mathematical creative thinking skills is 0.76 (high category) which means that almost all students show a fairly good response to the Project-based model Learning with a STEM approach.

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CONCLUSION

Based on the results of hypothesis testing and data analysis, it was concluded that there was an influence of the STEM approach assisted by Google Classroom on the creative thinking skills of class VIII students of SMPN 20 Bandar Lampung.

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