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The Development of Students' Creative Thinking Ability Using the Stem-Based Simulation Method about Single and Multiple Interest of Students of SMA N 3 Rantau Utara

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Abstract

This research is a literature study on students' creative thinking skills. This study aims to analyze students' creative thinking skills using a stem-based simulation method regarding single and compound interests of North Rantau High School students. The research method used in this study is a qualitative descriptive method. The type of data used in this study is qualitative data, which is categorized into two types, namely primary data and secondary data. Sources of data obtained through library research techniques (library study) which refers to sources available both online and offline such as: scientific journals, books and news sourced from trusted sources. The results of the study concluded that through the STEM teaching method, students were accustomed to working on questions with many correct answers or many strategies that could be used to solve problems. After being given the final task in the form of problems, the researchers arranged students' creative thinking patterns and analyzed the results of students' creative thinking by emphasizing the creative thinking aspect.

Keywords
creativity; STEM; single; compound flowers

I. Introduction

The taxonomy of educational goals compiled by Bloom is a framework for classifying the learning outcomes that are expected or intended to be achieved by students(Widiyanto & Yunianta, 2021). Bloom's Taxonomy dimensions include remembering, understanding, applying, analyzing, evaluating, and creating.(Shahrir, 2019). The highest goal is to create and requires the ability to think creatively to achieve it(Suryadi, 2010). This ability is needed in the future of every student.(Ervync, 1991)states that creativity plays an important role in the full cycle of mathematical thinking(Artikasari & Saefudin, 2017). Creative thinking or creativity itself is still an interesting issue among researchers(Putri et al., 2019). Designing lessons that can give students more opportunities to explore problems that provide multiple solutions can improve students' ability to think creatively (Silver, 1997; Hamza and Griffith, 2006).(Fardah, 2012).

In the midst of the COVID-19 pandemic, teaching and learning activities have been shifted to the online system(Damayanti et al., 2017). The outbreak of this virus has an impact of a nation and Globally (Ningrum et al, 2020). The presence of Covid-19 as a pandemic certainly has an economic, social and psychological impact on society (Saleh and Mujahiddin, 2020). Covid 19 pandemic caused all efforts not to be as maximal as expected (Sihombing and Nasib, 2020). The online learning process is a learning set by the government so that the teaching and learning process can still be carried out during the pandemic(Budiarti, 2015). The online learning process will be more effective when using an approach that supports the use of technology in carrying out learning(Artikasari &

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Saefudin, 2017). An approach that can help the implementation of the online learning process is the STEM approach(Damayanti et al., 2017). The STEM approach refers to the integration of technology/engineering design concepts into the teaching and learning of science/mathematics in the school curriculum(Purwaningrum, 2020). This approach is believed to be an alternative in instilling 21st century skills which include critical thinking skills (critical thinking), communication (communication), collaboration (collaboration), and creative thinking (creative thinking).(Mom, 2016). STEM learning is a learning approach that combines elements in the fields of science (Science), technology (Technology), engineering (Engineering), and mathematics (Mathematics) in a series of learning processes(Mom, 2017). The learning is aimed at reconstructing students who are looking for information and finding out knowledge that is able to solve problems, cooperate, and tolerate diversity. If the desire is successful in a satisfying way, it will increase students' self-confidence as well as a high sense of responsibility and civilized humans who can identify themselves with stable, independent personalities and have emotional stability with intellectual knowledge. (Pradana, D. et al. 2020)

Mathematics is one of the fields of science that is included in the classification of exact sciences, namely a group of science that is more concerned with understanding than memorizing.(Budiarti, 2015). Based on this, to understand a mathematical subject, students must first master mathematical concepts, so that students can better understand a particular mathematical subject and can apply it to solve the problems they are facing.(Mentari et al., 2018).

SMA N Rantau Utara is one of the schools in the district. Rantau Sel., Kab. Labuhanbatu, North Sumatra with 498 students. One of the subjects that is still an obstacle for students is mathematics, this can be seen from the results of student exams in mathematics in table 1 below:

Table 1. North Rantau N High School Student Mathematics Exam Results

Class	Math Exam Results		Total students
	Beyond KKM	Not Exceeding KKM	
X	183	21	204
X1	123	34	157
X11	125	12	137

Source: Primary data managed by researchers

Based on the table, it can be seen that students' mathematics test scores are still below the KKM or not exceeding the KKM, this shows the need for research related to students' creative thinking skills in mathematics. In particular, in this study, students' abilities in single and compound interest materials will be discussed

A similar study was also conducted by Dini Kinati Fardah with the title "Analysis of Students' Creative Thinking Process and Ability in Mathematics Through Open-Ended Assignments". the creative thinking process includes the following stages: knowing the existence of problems, information gaps, missing elements, understanding the problem, making assumptions and formulating hypotheses, testing hypotheses and evaluating; communicate ideas. The difference between this research and previous research is in the analytical method used by the researcher. In this study, the analysis used by researchers on students is a STEM-based simulation method.

II. Research Method

The research method used in this study is a qualitative descriptive method. The type of data used in this study is qualitative data, which is categorized into two types, namely primary data and secondary data. Sources of data obtained through library research techniques (library study) which refers to sources available both online and offline such as: scientific journals, books and news sourced from trusted sources. These sources are collected based on discussion and linked from one information to another. Data collection techniques used in this study were observation, interviews and research. This data is analyzed and then conclusions are drawn.

III. Result and Discussion

STEM-based teaching materials have been developed in various subjects and various levels of education(Mentari et al., 2018). The teaching materials developed are used by the teacher in supporting the learning process. Various types of teaching materials can be developed, but this study only discusses research on the development of teaching materials in the form of Student Worksheets (LKPD).

(Kuswanto, 2016)suggested the advantages of the developed STEM-based module, namely: (1) helping students learn independently; (2) help students find the concept of the material; (3) the material provided is easier for students to understand. In addition, Silvia & Simatupang (2020), and Sari et al. (2018) proves that STEM-based teaching materials are effective in improving students' scientific literacy skills.

Not only students' academic abilities, according to(Hidayat, 2010)The design of teaching materials equipped with illustrations and contextual problems related to science, technology, and engineering has the potential to make it easier for students to learn mathematics, which is known as a difficult and abstract subject. In addition, STEM-based teaching materials stimulate students to think creatively(Fitriarosah, 2016).

Based on the description above, STEM-based teaching materials have the potential to be developed in increasing student creativity. Similar to the study conducted by Oktavia (2019) which stated that STEM-based teaching materials were suitable to be developed to support success in learning(Firdaus et al., 2018).

In summary, the justification for the problems and solutions found by researchers at SMA N Rantau Utara can be seen in Table 2.

Table 2. Justification of problems and solutions

Problem	Solution
Low knowledge related to STEM learning	Socialization about STEM learning
Low skills in managing STEM learning	Introduction to the application of STEM learning patterns in the classroom
	STEM learning practice simulation
Teachers' perceptions of STEM learning in some aspects still tend to be negative	Open discussion related to STEM learning accompanied by STEM-based material simulation.
	Evaluation of the implementation of activities

Source: Primary data managed by researchers

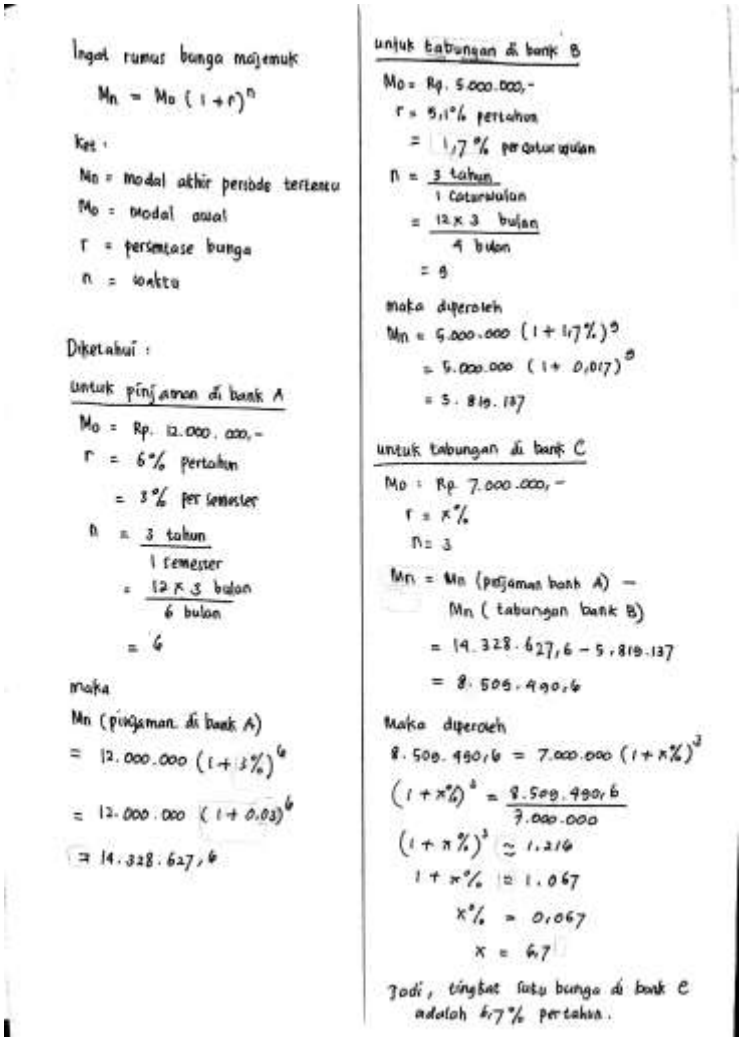
The training was divided into five stages, namely: 1) STEM learning socialization, 2) STEM learning implementation pattern introduction, 3) STEM learning simulation, 4) open discussion related to STEM learning, and 5) activity implementation evaluation. This pattern follows the implementation of PKM by(Fardah, 2012)by making adjustments to the content of the study.

<table>
<tr><td colspan="2">A. Learning objectives</td></tr>
<tr><td colspan="2">Through the Problem Based Learning learning model assisted by LKPD (Participant Worksheets)
Educate), students are able to:
1. Analyze single interest and compound interest
2. Solve contextual problems related to single interest and compound interest</td></tr>
<tr><td colspan="2">B. Learning Activities</td></tr>
<tr><td>Learning model</td><td>Stage 1: Orienting students to the problem
a. Students are invited to pay attention to the problems given by the teacher.
(Scientific – Observing, 4C – Critical Thinking)
Stage 2: Organizing students to learn.
a. Students are divided into small groups.
b. Students are directed to discuss and observe the LKPD that is distributed.
(Scientific – Asking)
Stage 3: Guiding individual and group investigations
a. Students collect information to solve problems on LKPD with facilitation from the teacher.
(Scientific – Gathering Information, First Aid – Mutual Cooperation, 4C – Communication, Creative Thinking, Collaboration)
Stage 4: Develop and present the work
a. Each group presents the results of their group investigation. (Scientific – Communicating)
b. The teacher facilitates other students who have different opinions to
express his opinion. (4C – Critical Thinking)
Stage 5: Analyze and evaluate the problem solving process
a. Students make conclusions together from the results of the previous discussion.
b. The teacher confirms the conclusions conveyed by the students as well as
give appreciation to students who have actively participated in the discussion and presentation process.
III. Closing
a. Students work on evaluations related to the material provided
b. Students receive feedback on the results of the evaluations carried out by students
The teacher and students end</td></tr>
</table>

Source: Primary data managed by researchers

3.1 Activity 1

Mr. Lukman took a loan at Bank A for Rp 12,000,000,-12,000,000,− with compound interest of 6 \%6% per year which is calculated per semester for 3 years. From the loan money, Rp 5,000,000,000,5,000,000, - he saves in Bank B with a compound interest rate of 5.1 \%5.1% per year which is calculated quarterly. The rest he saves in Bank C with a compound interest rate per year. If 3 years later Mr. Lukman took all of his savings (total savings in Bank B and total savings in Bank CC) to pay off his debts. Answer the following questions: a. What is the interest rate at Bank C if all of his savings are used up to pay off debt?


Ingat rumus bunga majemuk

$M_n = M_o (1+r)^n$

Ket :

M_n = modal akhir periode tertentu

M_o = modal awal

r = persentase bunga

n = waktu

Diketahui :

untuk pinjaman di bank A

M_o = Rp. 12.000.000,-

r = 6% pertahun

= 3% per semester

n = 3 tahun / 1 semester = 12 x 3 bulan / 6 bulan

= 6

maka

M_n (pinjaman di bank A)

$= 12.000.000 (1+3\%)^6$

$= 12.000.000 (1+0.03)^6$

$= 14.328.627,6$

untuk tabungan di bank B

M_o = Rp. 5.000.000,-

r = 5,1% pertahun

= 1,7 % per caturwulan

n = 3 tahun / 1 caturwulan = 12 x 3 bulan / 4 bulan

= 9

maka diperoleh

$M_n = 5.000.000 (1+1,7\%)^9$

$= 5.000.000 (1+0,017)^9$

$= 5.819.137$

untuk tabungan di bank C

M_o : Rp 7.000.000,-

$r = x\%$

$n = 3$

M_n = M_n (pinjaman bank A) − M_n (tabungan bank B)

$= 14.328.627,6 - 5.819.137$

$= 8.509.490,6$

Maka diperoleh

$8.509.490,6 = 7.000.000 (1+x\%)^3$

$(1+x\%)^3 = \frac{8.509.490,6}{7.000.000}$

$(1+x\%)^3 \simeq 1,216$

$1+x\% = 1,067$

$x\% = 0,067$

$x = 6,7$

Jadi, tingkat suku bunga di bank C adalah 6,7% pertahun.

Figure 1. *Student Answers*

This is done to check whether what they write is in accordance with what they think. From starting to read the questions, high category students immediately understand the meaning of the questions given.

Moderately capable students did not understand the problem at first, but after reading several times and seeing the examples given they finally understood the meaning of the questions.

Low-ability students do not understand what is meant by the problem and still need the help of the teacher to understand the problem. Because they did the task incompletely,

Table 3. Creative Thinking Processes and Products in High, Medium and Low Categories

Category	Creative Thinking Process	Creative Thinking Results
Tall	Students can understand the problem and they can estimate the solution, then make a plan, implement the plan and evaluate if there are obstacles in obtaining a solution. They can communicate their ideas both orally and in writing clearly and coherently.	The creative thinking products of high-ability students are of various kinds and in various categories, even the responses they give are different when compared to other students. The results they provide are also quite detailed and complete.
Currently	Students can understand the problem and can predict the solution, plan and implement the plan, but when they encounter problems in carrying out the plan they easily give up and even cancel the procedure. which they have arranged.	Creative thinking products from this moderate category are less varied in terms of responses, categories and some of these responses are the same as other students. the results they provide are less detailed and complete.
Low	Students find it difficult to understand the problem and predict the solution. When they draw up a settlement plan they do not know whether the method they have given is correct or not.	The creative thinking products of low-ability students did not vary and even the responses they gave were very few and very general. The description of the answers was not detailed and incomplete.

Source: Primary data managed by researchers

IV. Conclusion

This research concentrates on the analysis of students' creative thinking processes and abilities. Through the STEM teaching method, students are accustomed to working on questions with many correct answers or many strategies that can be used to solve problems. After being given a final task in the form of a problem, the researcher develops students' creative thinking patterns and analyzes the results of students' creative thinking by emphasizing aspects of creative thinking. Teachers can provide more opportunities for students to explore various kinds of answers and solutions by paying attention to aspects of fluency, flexibility, authenticity, and detail. Teachers and researchers can also make comparisons or see the influence of other aspects on creative thinking such as gender, ethnicity, learning achievement, or other aspects.

References

Artikasari, EA, & Saefudin, AA (2017). Growing and developing mathematical creative thinking skills with a contextual teaching and learning approach. Journal of Math Educator Nusantara: Forum for Publication of Scientific Papers in Mathematics Education, 3(2), 73–82.

Budiarti, Y. (2015). Development of creativity skills in social studies learning. Journal of Economic Education UM Metro, 3(1), 61–72.

Damayanti, C., Rusilowati, A., & Linuwih, S. (2017). Development of an ethnoscience integrated science learning model to improve learning outcomes and creative thinking skills. Journal of Innovative Science Education, 6(1), 116–128.

Ervync, G. (1991). Advanced Mathematical Thinking. Hingham, MA. USA: Kluwer Academic Publishers.

Fardah, DK (2012). Analysis of students' creative thinking processes and abilities in mathematics through open-ended tasks. Kreano, Journal of Creative-Innovative Mathematics, 3(2), 91–99.

Firdaus, HM, Widodo, A., & Rochintaniawati, D. (2018). Analysis of creative thinking skills and the process of developing creative thinking skills of junior high school students in Biology learning. Assimilation: Indonesian Journal of Biology Education, 1(1), 21–28.

Fitriarosah, N. (2016). Development of Mathematical Creative Thinking Instruments for Junior High School Students. Proceedings of the National Seminar on Mathematics Education, 1, 243–250.

Hidayat, R. (2010). Contextual Learning with REACT Strategy in Efforts to Develop Problem Solving, Critical Thinking, and Mathematical Creative Thinking Skills for Business Students. Indonesian education university.

Kuswanto, H. (2016). Development of Students' Mathematical Creative Thinking Skills Through Creative Problem Solving Learning Models with an Open Ended Approach.

Mentari, D., Sumpono, S., & Ruyani, A. (2018). Development of e-book learning media based on the results of 2-d electrophoresis research to measure students' creative thinking skills. PENDIPA Journal of Science Education, 2(2), 131–134.

Moma, L. (2016). Development of mathematical creative thinking ability instruments for junior high school students. Delta-Pi: Journal of Mathematics and Mathematics Education, 4(1).

Moma, L. (2017). Development of students' creative thinking skills and mathematical problem solving through discussion methods. Journal of Educational Horizons, 36(1), 130–139.

Ningrum, P. A., et al. (2020). The Potential of Poverty in the City of Palangka Raya: Study SMIs Affected Pandemic Covid 19. Budapest International Research and Critics Institute-Journal (BIRCI-Journal) Volume 3, No 3, Page: 1626-1634

Pradana, D. et al. (2020). Nasionalism: Character Education Orientation in Learning Development. Budapest International Research and Critics Institute-Journal (BIRCI-Journal).P. 4026-4034

Purwaningrum, JP (2020). Development of mathematical creative thinking skills through discovery learning. Pasundan Journal of Mathematics Education Journal of Mathematics Education, 6(2), 102–114.

Putri, CA, Munzir, S., & Abidin, Z. (2019). Students' mathematical creative thinking skills through the brain-based learning model. Journal of Didactic Mathematics, 6(1), 12–27.

Saleh, A., Mujahiddin. (2020). Challenges and Opportunities for Community Empowerment Practices in Indonesia during the Covid-19 Pandemic through Strengthening the Role of Higher Education. Budapest International Research and Critics Institute-Journal (BIRCI-Journal). Volume 3, No 2, Page: 1105-1113.

Sihombing, E. H., Nasib. (2020). The Decision of Choosing Course in the Era of Covid 19 through the Telemarketing Program, Personal Selling and College Image. Budapest International Research and Critics Institute-Journal (BIRCI-Journal) Volume 3, No. 4, Page: 2843-2850.

Suryadi, E. (2010). Effective Communication Model for the Development of Children's Creative Thinking Ability. Accredited Journal of Communication Studies, 8(3), 263–279.

Syahrir, S. (2019). Development of Middle School Mathematics Learning Tools to Improve Creative Thinking Ability. Scientific Journal of Mandala Education, 2(1), 436–441.

Widiyanto, J., & Yunianta, TNH (2021). Development of the TITUNGAN Board Game to Train Students' Mathematical Creative Thinking Ability. Mosharafa: Journal of Mathematics Education, 10(3), 425–436.