SYSTEMATIC LITERATURE REVIEW: ANALISIS SOAL MATEMATIKA MATERI BILANGAN BULAT DITINJAU DARI KEMAMPUAN BERPIKIR KREATIF SISWA

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ABSTRAK

Penelitian ini bertujuan untuk mengevaluasi kemampuan berpikir kreatif siswa dalam menyelesaikan soal matematika khususnya pada topik bilangan bulat melalui metode Systematic Literature Review (SLR). SLR dilakukan dengan menelaah secara kritis 15 artikel ilmiah yang relevan, terbit dalam rentang waktu lima tahun terakhir. Hasil kajian menunjukkan bahwa secara umum, kemampuan berpikir kreatif siswa masih berada pada tingkat rendah, terutama pada indikator originality (keaslian ide) dan elaboration (pengembangan ide). Mayoritas siswa hanya mampu menunjukkan fluency (kelancaran) dalam menjawab soal, namun belum mampu menghasilkan solusi yang unik atau memperluas ide secara mendalam. Hal ini disebabkan oleh beberapa faktor. Pertama, soal-soal matematika yang diberikan di sekolah umumnya bersifat tertutup, berfokus pada satu jawaban benar, dan kurang mendorong eksplorasi gagasan. Kedua, pendekatan pembelajaran yang digunakan guru cenderung masih berorientasi prosedural, sehingga siswa terbiasa menghafal langkah-langkah tanpa memahami konsep secara mendalam. Ketiga, faktor internal siswa seperti rendahnya kepercayaan diri dan keterbatasan kemampuan akademik juga menjadi hambatan dalam berpikir kreatif. Studi ini merekomendasikan pentingnya pengembangan soal-soal terbuka, berbasis konteks, dan menantang untuk menumbuhkan semua aspek berpikir kreatif, termasuk fleksibilitas, elaborasi, dan orisinalitas. Selain itu, guru juga perlu mengubah pendekatan pembelajaran menjadi lebih eksploratif dan partisipatif agar siswa dapat terbiasa berpikir secara kreatif sejak dini.

Kata Kunci: berpikir kreatif, bilangan bulat, soal terbuka, systematic literature review, matematika

ABSTRACT

This study aims to evaluate students' creative thinking abilities in solving mathematical problems related to the topic of integers using the Systematic Literature Review (SLR) method. The SLR involved critically analyzing 15 relevant scientific articles published in the last five years. The findings reveal that students' overall creative thinking ability remains at a low level, particularly in the indicators of originality and elaboration. Most students are only able to demonstrate fluency in generating answers, but they struggle to produce unique solutions or elaborate ideas in depth. Several factors contribute to this condition. First, most math problems used in schools are closed-ended, emphasizing one correct answer and failing to encourage idea exploration. Second, teaching approaches still tend to be procedure-oriented, training students to memorize steps rather than understand underlying concepts. Third, internal student factors such as low academic confidence and limited problem-solving skills also hinder the development of creative thinking. This study suggests the importance of designing open-ended, contextual, and challenging problems to stimulate all aspects of creative thinking, including fluency, flexibility, elaboration, and originality. Furthermore, teachers are encouraged to adopt more explorative and student-centered approaches in the classroom to foster a culture of creative thinking from an early stage of learning.

Keywords: creative thinking, integers, open-ended problems, systematic literature review, mathematics education

INTRODUCTION

Mathematics is a basic subject that requires not only precise calculations but also the ability to think logically and creatively. One of the basic materials taught since elementary school is integers, which includes positive and negative counting operations, as well as the application of concepts in daily life. However, based on the results of the Minimum

Competency Assessment (AKM) released by the Ministry of Education, Culture, Research, and Technology in 2022, it was found that more than 45% of Indonesian junior high school students have a low numeracy level, especially in solving non-routine mathematics problems with integer material. This is further strengthened by the results of the Programme for International Student Assessment (PISA) in 2022, where Indonesia is ranked 72nd out of 81 countries in the mathematics literacy category, which indicates that students have weak high-level thinking skills.

This problem is further strengthened by the results of the 2022 Minimum Competency Assessment (AKM) which shows that more than 45% of Indonesian junior high school students have low numeracy skills, especially in solving non-routine problems. Furthermore, the results of the PISA international study (2022) also show that Indonesia is ranked 72nd out of 81 countries in the mathematics literacy category. This data shows fundamental weaknesses in students' high-level thinking skills, including the creative thinking required for situational problem-solving.

Creative thinking skills are among the essential competencies that students must master to successfully navigate the demands of the 21st century, an era marked by rapid technological advancements, dynamic change, and increasing complexity in everyday life. These skills enable individuals to approach problems from various perspectives, generate novel ideas, and adapt flexibly to unforeseen situations. Without developing creative thinking from an early stage, students may face significant difficulties in solving real-world problems, making informed decisions, or designing innovative solutions—skills that are increasingly required both in academic contexts and future professional environments.

One of the main factors that inhibits the growth of creative thinking in students is the quality and structure of learning materials, especially the math problems commonly used in classrooms. When such problems are strictly procedural, closed-ended, and focused only on a single correct answer, they tend to limit students' cognitive exploration. As a result, students become accustomed to memorizing formulas rather than understanding concepts or applying them creatively. Given the crucial role of problem design in shaping students' thinking patterns, it is vital to evaluate and improve the structure, form, and purpose of math questions, particularly those in integer topics. This study seeks to conduct a Systematic Literature Review (SLR) to investigate the extent to which math problems related to integers are capable of measuring and stimulating students' creative thinking. Through in-depth qualitative analysis of existing research, this study aims to contribute to the development of more contextual, open-ended, and creativity-oriented assessment tools that reflect the evolving goals of mathematics education in the digital and globalized era.

METHOD

The method employed in this study is the Systematic Literature Review (SLR), which is a structured and rigorous approach used to collect, evaluate, and synthesize findings from existing research on a specific topic. This method allows researchers to obtain a clear and comprehensive understanding of current knowledge, research gaps, and trends within a particular area of study. In the context of this research, SLR was chosen to investigate how students' creative thinking skills are reflected and developed when working on mathematics problems involving integers. The SLR process in this study involved several stages. First, we defined the research question and determined the inclusion criteria for selecting articles, such as the relevance to creative thinking in mathematics, the focus on integer content, and publication in peer-reviewed journals between 2018 and 2024. Second, we searched for relevant literature using established academic databases, including Google Scholar and Semantic Scholar, using keywords such as *"creative thinking in mathematics"*, *"integer problems"*, *"open-ended questions"*, and *"mathematics learning"*. From this search, 15 articles were selected based on their alignment with the topic and the

quality of their research methods. We further analyzed these articles through qualitative content analysis to identify patterns, themes, and insights regarding how integer problems are constructed and how they support or limit students' creativity. The goal of this method is not only to map existing research but also to provide a solid foundation for the development of assessment instruments and learning materials that foster creative thinking in mathematics education.

RESULTS AND DISCUSSION

The results of the literature obtained from the articles are divided into 2 parts, namely the section on students' creative thinking skills.

1. Research on Students' Creative Thinking Skills

Some research articles on Students' Creative Thinking Abilities are presented in Table 1.

Table 1. Research on Students' Creative Thinking Ability

Journal	Author	Research Results
Jurnal Ilmiah Mahasiswa, Vol.4, No. 1, Maret 2023	Rafina, Mulia Putra,dan Mik salmina (2023)	The ability to think creatively has a very important position, with the training of creative thinking skills students are able to produce innovative new ideas.
Jurnal Pendidikan Guru matematika, Vol.2,No.1,Januari 2022	Nurfajri Hamam,In Hi.Abdullah,dan Nurma Angkotasan (2022)	This study aims to describe students' mathematical creative thinking ability in solving problems in integer material, with results showing that students' creative thinking skills are still in the category of lacking.
Jurnal Ilmiah Wahana Pendidikan, Vol.11,No3, July 2023	Dominggus Ole Dewa,Welas Listiani	Students' creativity develops well if students are able to think creatively to solve a problem, especially in integer material which is the basis for further understanding mathematics.
Jurnal Pendidikan Matematika,Vol.11,No1, Januari 2022	Farah Febrianingsih	Students' creative thinking skills are determined by essay questions where students with high mathematical ability have a very creative level of thinking, students with medium mathematical ability have a level of creative thinking/quite creative, while students with low mathematical skills have a level of thinking that is less creative/uncreative.
Jurnal Didactical Mathematics,Vol.5,No2, Oktober 2023	Silvia Dara Puspita , Sutirna (2023)	The results of the study are that the creative thinking ability of students in one of the schools in Bekasi Regency is moderate. The student fluency indicator has not been able to provide many ideas/problem solving smoothly. The student's *flexibility* indicator is able to provide varied answers/ideas. The student*'s Originality* Indicator has not provided unique or unusual answers. Indicators of *elaboration* of students have not been able to develop their ideas.
Jurnal Penelitian	Maria W.V	The results of the study show that there are

Pendidikan, Vol.1, No,1,2023	Lupa,Aloysius Fernandez,Yohanes Jagom	differences in the mathematical creative thinking ability of students at the same level of education.not all students have the same level of creative thinking ability and there are still some students who have not met the aspects of creative thinking.
Jurnal Pendidikan Matematika dan sains,Vol.8,No.2,2020	Harsayandaru Himawan,I Nengah Parta,Abd.Qohar,Toto Nusantara	This study found that the creative thinking ability of junior high school students in integer material is still low. Students tend to have difficulty understanding concepts, devising completion strategies, and verifying answers, despite showing signs of creativity such as flexibility and originality.

Table 1 summarizes seven studies that aim to understand students' creative thinking skills, especially their ability to solve integer math problems. Each study used indicators of creativity, including. *Fluency*, The ability of students to come up with multiple ideas or answers. *Flexibility*, Ability to look at problems from multiple perspectives. *Originality*, Ability to provide unique and unusual answers. *Elaboration*: The ability to expand or develop ideas in detail.

Most of the findings show that the fluency indicator is the most common indicator achieved by students. This means that many students are able to provide multiple answers to a question, even if these answers are not necessarily diverse or in-depth. However, student performance is still very limited in terms of originality and refinement. This suggests that students don't feel comfortable exploring new approaches or explaining solutions in depth.

According to research by Silvia Dara Puspita and Sutirna (2023), it shows that students still have difficulty developing ideas in detail and have not been able to come up with unique answers. Another study conducted by Febrianingsih (2022) even linked creative thinking skills to students' level of mathematical ability, where high-ability students tend to have strong creative thinking skills, while low-ability students tend to have no creativity at all. This means that math learning in schools needs to provide more space for exploratory activities and open-ended problem-solving, rather than just routine exercises. This will allow students' creative thinking abilities to fully develop on all indicators.

2. **Research on Integer Material Mathematics Problems Reviewed from Students' Creative Thinking Ability**

Several research articles on integer material mathematics problems reviewed from students' creative thinking skills are presented in Table 2.

Table 2. Research on Integer Mathematics Problems Reviewed from Students' Thinking Ability

Journal	Author	Research Results
Jurnal Ilmiah Mahasiswa, Vol.4,No.1, Maret 2023	Rafina,Mulia Putra,dan Mik Salmina (2023)	Students with high academic scores show good mastery of creative thinking indicators such as *fluency* (the ability to generate many ideas) and *flexibility* (the ability to use various completion strategies). On the other hand, students with low scores tend to use only one rigid way of stacking and minimal exploration of ideas.
Jurnal Pendidikan Guru	Nurfajri Hamam,In	Of all students analyzed, only 7.69%

Matematika,Vol.2,No,1,Januari 2022	Hi.Abdullah,dan Nurma Angkotasan (2022)	met all creative thinking indicators (*fluency, flexibility, elaboration, originality*). The majority of students are only able to solve the problem in a standard way without being able to develop new methods or explain the steps in detail.
Jurnal Riset dan Inovasi Pendidikan Matematika,Vol.2,No.1, Juni 2021	Ditaul safitri, Maryanti (2021)	Students with high confidence levels are able to generate more unique ideas in solving problems, as well as show a variety of approaches and clarity of reasoning. In contrast, students with low self-confidence tend to be fixated on completion strategies.
Jurnal Theorems(The Original Reasearch Of Mathematics),Vol.7,No.1, Juli 2022	Teti Melindarwati,Dadang Rahman Munandar (2022)	The ability to solve mathematical problems in grade VII students, in solving integer material is still categorized as low. Students with low categories are not used to using answers according to procedures so that they only meet one problem-solving indicator.
Jurnal Ilmiah Pendidikan Dasar,Vol.08,No 03,Desember 2023	Lale Yasmin,Ida Ermiana,Vivi Rachmatul hidayati (2023)	This study describes the results of students' tests regarding integer counting operations. Students who have been given tests in the form of positive integer and negative integer calculation operation questions, it was found that most students have abilities in the medium and low categories.
Jurnal Ilmiah Matematika dan Pendidikan Matematika,Vol14,No 2,2024	Silviyah Yolanda Febrianti,Eliska Juliangkary,Sri Yuliyanti (2024)	The results of the creative thinking analysis showed that students with high mathematical ability met most of the indicators, namely flexibility, elaboration, and originality, students with moderate and low abilities still had limitations on the indicators of fluency, flexibility, and elaboration, highlighting the need for more innovative learning methods to encourage the exploration of how to solve problems, develop ideas, and practice intensive questions for Improve creative thinking skills across all skill categories.
Jurnal Matematika,Vol.4,No.1,Januari 2024	Alfianus Tamo Ama,Yulius keremata Lede,Samuel Rex M.Making (2024)	This study shows that students have difficulty solving integer problems after online learning.
Jurnal Matematika dan	Wa Ode Sartini,	This study found that Al-Hijrah Ambon

Pembelajaran,Vol.2,No.2 2013	Sarfa Wassahua, Ainun Diana Lating	Junior High School students were able to show creative thinking skills in solving algebraic integer multiplication problems, especially in the aspects of fluency, flexibility, and uniqueness of ideas. Although not optimal, students show the potential for creative thinking that can be developed through a learning approach that supports open-ended exploration and problem-solving.

Table 2 discusses eight studies that evaluate the quality of integer math problems and their impact on students' creative thinking skills. The core conclusions of various articles show that most of the questions used in schools are still closed, routine and programmed, and therefore fail to stimulate students' creative thinking.

Research by Rafina et al. (2023) shows that students with high academic achievement are able to master indicators such as fluency and *flexibility*, while students with low academic achievement only think rigidly and do not look for alternative problem-solving. Meanwhile, research by Hamam et al. (2022) showed that only 7.69% of students were able to fully meet all four indicators of creative thinking, a figure that suggests that the design of the questions has not been enough in stimulating creativity.

Several studies have also found a positive correlation between self-confidence and creative thinking skills, such as research conducted by Safitri and Maryanti (2021). More confident students tend to come up with more ideas and dare to try different approaches, while less confident students tend to stagnate. The results in Table 2 show that mathematical problems, especially on the topic of integers, need to be reframed so that,Open: There are several answers or solution strategies. Situational: Relevant to the student's daily life. Challenging: Encouraging exploration and innovation in problem-solving. In this way, math problems become not only a tool for measuring memory, but also a tool for developing higher-level thinking skills.

CONCLUSION

Based on the results of the analysis and discussion of the 15 selected articles, several important conclusions can be drawn. First, it is evident that students' creative thinking ability in solving integer-related mathematics problems is still relatively low. Furthermore, the distribution of achievement across the indicators of creative thinking—namely fluency, originality, elaboration, and flexibility—is uneven. Most students tend to fulfill the fluency indicator, meaning they are able to generate several ideas or answers, but they often fall short in aspects such as originality (producing unique or novel ideas) and elaboration (developing ideas in depth). This suggests that students may rely heavily on familiar procedures or patterns rather than thinking creatively and independently. Influencing factors such as academic ability, classroom learning environment, and teaching strategies significantly impact the development of students' creative thinking.

Second, the review also reveals that the integer problems commonly used in schools are still not sufficiently stimulating and are not explicitly designed to promote creative thinking. Many of these problems are procedural, closed-ended, and emphasize finding a single correct answer, which limits students' opportunities to explore and express diverse ideas. Only a small proportion of students are able to fulfill all four indicators of creativity when faced with such questions. Therefore, there is an urgent need to develop open-ended, contextual, and cognitively challenging math problems that are capable of fostering students' full creative potential. Such improvements in instructional design are essential to

support higher-order thinking and better prepare students for the complex challenges of the 21st century.

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