Inovasi Kurikulum *- p-ISSN 1829-6750 & e-ISSN 2798-1363*
Volume 22 No 1 (2025) 107-118

JURNAL UPI

Inovasi Kurikulum

https://ejournal.upi.edu/index.php/JIK

HIPKIN

Analysis of creative thinking ability in implementing the PBM-B3 Model

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ABSTRACT

Indonesian students' low creative thinking ability at both international and national levels highlights the need for further efforts to improve the quality of mathematics education in Indonesia. This research aims to describe the level of students' mathematical creative thinking abilities and students' difficulties in completing students' mathematical creative thinking ability tests after implementing the Batak Culture Problem-Based Mathematics Learning model (PBM-B3). This research is a qualitative descriptive research. The subjects of this research were fourth-grade students at SD Negeri 030280 Sidikalang. In contrast, the object of this research was the ability to think creatively in mathematics in applying the PBM-B3 model. The research results indicate that students' mathematical creative thinking abilities improved after implementing the PBM-B3 model compared to conventional methods. Most students fall into the medium category, while very high, high, and low categories represent smaller percentages. Indicator analysis shows fluency in the high category, flexibility and elaboration in the medium category, and originality in the low category. Students in the very high category excelled across all indicators. In contrast, those in the high category faced difficulties with principles, while those in the medium and low categories struggled with principles and procedures.

ARTICLE INFO

Article History:
Received: 17 Aug 2024
Revised: 14 Dec 2024
Accepted: 20 Dec 2024
Available online: 27 Dec 2024
Publish: 28 Feb 2025

Keywords:
Batak culture; creative thinking ability; Mathematical problems-based learning; PBM-B3

Open access
Inovasi Kurikulum is a peer-reviewed open-access journal.

ABSTRAK

Rendahnya kemampuan berpikir kreatif peserta didik Indonesia di tingkat internasional maupun nasional menyoroti perlunya upaya lebih lanjut dalam meningkatkan kualitas pendidikan Matematika di Indonesia. Penelitian ini bertujuan untuk mendeskripsikan tingkat kemampuan berpikir kreatif matematis peserta didik dan kesulitan peserta didik dalam menyelesaikan tes kemampuan berpikir kreatif matematis peserta didik setelah pelaksanaan model Pembelajaran Matematika Berdasarkan Masalah Berbasis Budaya Batak (PBM-B3). Penelitian ini merupakan penelitian deskriptif kualitatif. Subjek penelitian ini adalah peserta didik kelas IV SD Negeri 030280 Sidikalang, sedangkan objek dalam penelitian ini adalah kemampuan berpikir kreatif matematis dalam penerapan model PBM-B3. Hasil penelitian menunjukkan bahwa kemampuan berpikir kreatif matematis peserta didik meningkat setelah penerapan model PBM-B3 dibandingkan pembelajaran konvensional. Sebagian besar peserta didik berada pada kategori sedang, sementara kategori sangat tinggi, tinggi, dan rendah memiliki persentase yang lebih kecil. Analisis indikator menunjukkan kelancaran berada pada kategori tinggi, fleksibilitas dan elaborasi di kategori sedang, serta orisinalitas di kategori rendah. Peserta didik kategori sangat tinggi unggul dalam semua indikator, sedangkan kategori tinggi mengalami kesulitan pada prinsip, dan kategori sedang serta rendah mengalami kesulitan pada prinsip dan prosedur.

Kata Kunci: *budaya Batak; kemampuan berpikir kreatif; PBM-B3; pembelajaran Matematika berbasis masalah*

How to cite (APA 7)
Sinaga, M., Sinaga, B., & Rajagukguk, W. (2025). Analysis of creative thinking ability in implementing the PBM-B3 Model. *Inovasi Kurikulum, 22*(1), 107-118.

Peer review
This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.

https://doi.org/10.17509/jik.v22i1.73719

INTRODUCTION

Life in the 21st century demands many skills to be mastered by everyone. The challenge of competency in the 21st century impacts all aspects, including the world of education in Indonesia, to prepare students to compete globally. The Indonesian Ministry of Education and Culture 2017 stated that there are four competencies that students must have in the 21st century, called 4C, namely Critical Thinking and Problem Solving, Creativity, Communication Skills, and the Ability to Work Collaboratively. Based on this explanation, it is known that one of the essential competencies that students must have is the ability to think creatively.

Creative thinking is a skill needed in the 21st century; however, the assumption of creative thinking ability is irrelevant to reality. Based on the results of the Global Creativity Index (GCI) study in 2015, the creative thinking ability of Indonesian students is still relatively low, where Indonesia is ranked 115 out of 139 countries, with an index of 0.202 (Patmawati *et al*., 2019). Then, a study conducted by Sari and Afriansyah found that students' overall mathematical creative thinking abilities were still low, with an average of only 50.27% (Sari & Afriansyah, 2022). Hasil serupa juga diperoleh dalam penelitian Rasnawati *et al*. yang menunjukkan bahwa kemampuan berpikir kreatif matematis peserta didik masih tergolong rendah, dengan rata-rata sebesar 39% (Rasnawati *et al*., 2019). Various studies conclude that students ' mathematical creative thinking ability in Indonesia is generally still low. Strengthened by the results of pre-research in July 2023 in class IV of SD Negeri 030280 Sidikalang with a mathematical creative thinking ability test, an average score of 40.15 was obtained, which is included in the very low category.

One of the causes of low creative thinking skills is teachers who do not provide enough variation in learning, such as the methods or models used (Amelia *et al*., 2024). One of the factors that causes students' creative thinking abilities in schools to be less than optimal is the learning process, which is not yet able to develop these abilities (Yolanda *et al*., 2021). In addition, learning is still focused on teachers. It does not actively involve students, so students are not free or involved in providing opinions or ideas, or asking and answering questions. Pre-research in class IV of SD Negeri 030280 Sidikalang also showed that the teacher delivered the learning process verbally to students, then provided examples, accompanied by solving problems, and ended with assignments. Teachers have not empowered students' creative potential by providing problem-solving questions requiring' creative thinking skills. This is in accordance with Ansari's explanation in "*Komunikasi Matematik, Strategi Berpikir dan Manajemen Belajar*" regarding the Mathematics learning process presented by the teacher, namely: 1) When teaching, teachers often give examples to students on how to solve problems; 2) Students gain understanding by listening to and watching the teacher do Mathematics calculations, after which the teacher encourages students to try to solve them themselves; and 3) in Mathematics learning, teachers provide direct explanations by providing examples and questions for practice.

Learning models are very important to support the creation of students' creative thinking skills, with facilities designed by teachers according to students' level of thinking in the classroom. One model that supports student-centered learning is the Problem-Based Mathematics Learning Model Based on Batak Culture (PBM-B3). The PBM-B3 model involves aspects of Batak culture (utilization of Batak cultural elements) in Mathematics education. Vygotsky stated that the results of thinking into an achievement are the result of a combination of individual and social achievements; on the other hand, these achievements bring awareness and motivation to learn in themselves (Almasri *et al*., 2023). This is in line with Suparno's opinion in "*Filsafat Konstruktivisme Dalam Pendidikan,*" which explains that one's participation always influences the activity of understanding in existing social and cultural practices, such as school situations, society, friends, and even context. Students will better understand how their culture is related to Mathematics (Fadilah *et al.*, 2024).

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The PBM-B3 model is a refinement of the Problem-Based Learning (PBL) model, which considers learning objectives, characteristics of Mathematics, and utilization of values. In the PBM-B3 model, cultural values, such as social interaction patterns, *Dalihan Na Tolu*, become integral to the problem-solving process. Students interact during group discussions, where they can collaborate, defend each other's opinions, ask questions, help each other, respond to ideas, and reach agreements to solve the problems faced. Constructivist theory and Batak cultural values are the basis of the PBM-B3 model, which emphasizes the importance of student-focused learning. Teachers act as facilitators, motivators, mediators, and consultants in the learning process in this situation. According to Sinaga in "*Pengembangan Model Pembelajaran Matematika Berdasarkan Masalah Berbasis Budaya Batak (PBM-B3)*", the implementation of the PBM-B3 model has a positive impact, where students can solve problems to reconstruct the concepts and principles of Mathematics, and are skilled in solving problems that are relevant to everyday life in their cultural context. In this context, students become accustomed to critically and logically analyzing their classmates' ideas, providing opinions based on previous learning experiences. On the other hand, problem-solving skills are important in developing students' creative thinking (Jumriana *et al*., 2022). On the other hand, it is also stated that creative thinking skills are needed in solving problems, especially complex problems (Hasanah & Putra, 2017).

Some previous research results related to the problems that are the reference for this research include research by Falah titled"*Penerapan Model Pembelajaran PBM-B3 dalam Konteks Budaya Mandailing Untuk Meningkatkan Kemampuan Pemecahan Masalah Dan Analisis Matematis Siswa Ma Syekh Sulaiman Baqi.*" It was found that there was an increase in students' mathematical problem-solving and mathematical analysis abilities when they were taught using the PBM-B3 model in the context of Mandailing Culture. Previous research revealed that there was a significant difference in computational thinking abilities between the experimental group of the PBM-B3 model and the experimental group of the conventional model, where the experimental group of PBM-B3 experienced an increase in computational learning (Marbun *et al*., 2023). In contrast to these studies, this study analyzes mathematical creative thinking skills in applying the PBM-B3 model. The PBM-B3 model that demands problem-solving skills is closely related to creative thinking skills. Problem-solving skills are an important component in developing students' creative thinking, and vice versa, creative thinking skills are needed to solve problems (Siswanto & Ratiningsih, 2020).

Furthermore, reviewed from the framework of developing education system renewal, applying a learning model based on local culture-based problems (Batak culture) follows the idea of educational decentralization currently being promoted. Decentralization is seen as a step to increase the effectiveness and efficiency of education, and is expected to strengthen the ability of regions to optimize their potential independently. This aspect is the main driving force in applying the PBM-B3 model to examine students' mathematical creative thinking skills in grade IV of SD Negeri 030280 Sidikalang, which has Batak cultural characteristics as a culture adopted by students.

LITERATURE REVIEW

Mathematical Creative Thinking Ability

Mathematical creative thinking is an essential mathematical ability that mathematics students must master and develop. Creative thinking is an individual activity to produce a series of new and original ideas from concepts, experiences, and knowledge acquired (Nurlita *et al*., 2023; Situmorang *et al*., 2023). This new idea or concept will produce various alternative solutions to overcome problems (Zakiah *et al*., 2020). Some literature states indicators in creative thinking ability, which when described are: 1) fluency, namely

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in providing many opinions, answers, alternatives or concepts in solving problems or in doing something else; 2) flexibility, namely providing answers, ideas, and questions that vary and can assess everything and problems from various points of view; 3) original thinking, namely giving birth to ideas, and new ideas that are original from the thoughts of different and unique individuals; 4) detailed thinking (elaboration), namely adding, developing, and issuing an idea, idea, concept by detailing and detailing it so that it looks easier to understand (Anindayati & Wahyudi, 2020; Fauzi *et al*., 2019; Ibrahim & Widodo, 2020; Maryani *et al*., 2019; Yanti *et al*., 2019).

Students' Learning Difficulties in Mathematics Learning

The learning difficulties experienced by students in mastering and applying various concepts and rules of Mathematics are directly related to the objects of Mathematics. There are four types of objects of Mathematics, namely facts, concepts, procedures, and principles (Siallagan *et al*., 2021). With the following explanation:

1. Factual difficulties: Students cannot understand mathematical symbols and cannot memorize or differentiate them.
2. Conceptual difficulties, namely the inability of students to understand concepts and apply concepts to solve problems, the inability to understand examples and non-examples, the inability to explain ideas or situations in their own words in writing, the inability to conclude information and a concept that is given, and the inability to state the meaning and terms that represent certain concepts.
3. Procedural difficulties, namely the inability of students to plan, complete, and describe the steps for solving Mathematics problems and the inability of students to use the correct algorithm.
4. Principle difficulties, namely the inability of students to apply the rules or formulas of Mathematics in solving problems, unable to carry out discovery activities about something and not being careful in calculations and algebraic operations, unable to connect between Mathematics in solving problems, unable to determine relevant factors and as a result unable to abstract patterns, and students can state a principle but cannot explain its meaning and cannot apply the principle.

Model Pembelajaran Matematika Berdasarkan Masalah Berbasis Budaya Batak (PBM-B3)

The Problem-Based Mathematics Learning Model Based on Batak Culture (PBM-B3) is based on a learning theory that adheres to the constructivist understanding that underlies the Problem-Based Learning (PBM) model and pays attention to the characteristics of Mathematics and the utilization of aspects of Batak culture. In other words, according to Sinaga in "*Pengembangan Model Pembelajaran Matematika Berdasarkan Masalah Berbasis Budaya Batak (PBM-B3),*" The PBM-B3 model is the result of modification or refinement of the Problem-Based Learning (PBL) model by paying attention to the characteristics of Mathematics, the objectives of learning Mathematics, and the use of cultural aspects (Batak culture) which greatly influence the activities and mental development of students during the learning process with the principle that:

1. Humans are active information processors born into a social matrix, where their thinking and perception are influenced. Culture, environment, and other people around them influence the act.
2. Mathematics is a cultural product resulting from social construction and problem-solving.
3. Adequacy of Batak cultural aspects in the Mathematics learning process.

The design of the learning stages of the PBM-B3 model includes cultural apperception, presentation, and problem solving with the *Dalihan Na Tolu* interaction pattern, presentation and development of work

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results, findings of Mathematics objects, reinforcement of new schemata, and analyzing and evaluating the process and results of problem solving. *Dalihan Na Tolu* is a guide to behaving amid society, or the kinship system (Firmando & Agama, 2021).

METHODS

This research is a descriptive qualitative research using a case study method. The subjects of this research were 20 students in grade IV of SD Negeri 030280 Sidikalang. The data analysis used in this research is qualitative. The analysis in the qualitative approach used in this research follows the model of Miles and Huberman. Sugiyono in his book "Metode Penelitian Kualitatif" states that there are three stages of qualitative data analysis: data reduction, Data display, and conclusion.. For more details, the process can be seen in **Figure 1** below.:

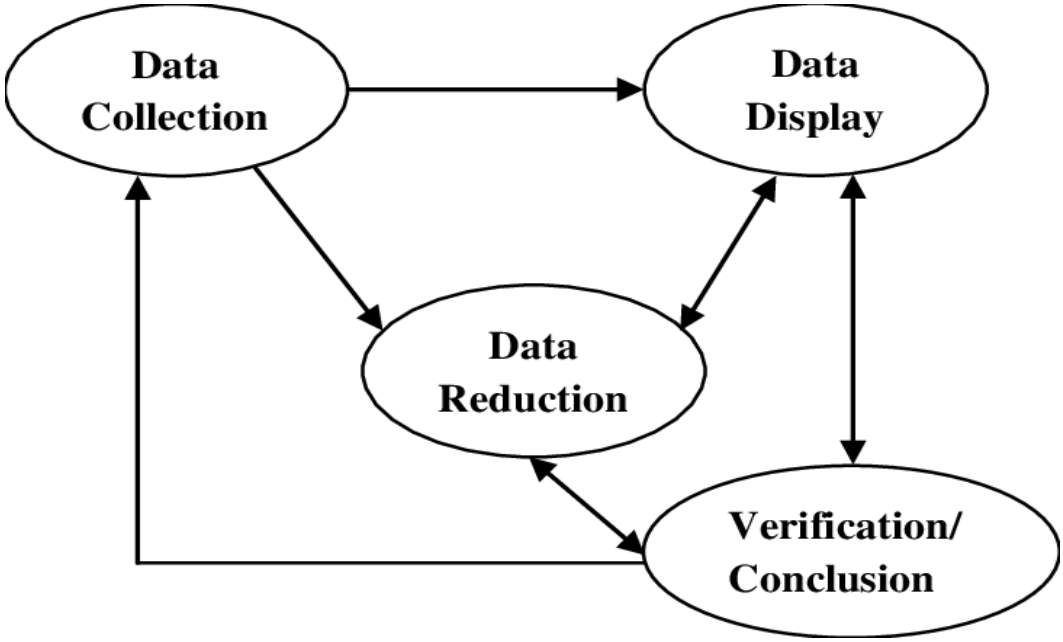

Figure 1. Research methods
Source: Sugiyono in the book "Metode Penelitian Kualitatif"

The students' mathematical creative thinking ability test data were analyzed descriptively to describe their creative thinking ability after implementing the PBM-B3 model. The students' mathematical creative thinking ability test is presented in **Table 1** with the criteria intervals.

Table 1. Level of Students' Mathematical Creative Thinking Ability

Value	Category Level
90 ≤ SKBK ≤ 100	Very high
80 ≤ SKBK < 90	High
65 ≤ SKBK < 80	Medium
55 ≤ SKBK < 65	Low
SKBK < 55	Very low

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Source: Adaptation of Nurkanca & Sunarta's score conversion in Faelasofi (2017)

The students' mathematical creative thinking ability test results were collected to be checked and scored. Each student's answer score was based on the established mathematical creative thinking ability test scoring guidelines. Based on the established scoring guidelines, the maximum score for each creative thinking indicator is the fluency indicator with a score of 10, flexibility with a score of 5, originality with a score of 5, and detail/elaboration with a score of 5, so that for each question the maximum score is 25. The total score of the four questions is 100. The values obtained are categorized into the mathematical creative thinking ability category, namely very high, high, medium, low, or very low, according to Table 1. Each category of students is analyzed to determine the patterns of student answers. Then, based on the dominant answer pattern, students will be selected as subjects to be interviewed.

RESULTS AND DISCUSSION

The Level of Students' Mathematical Creative Thinking Ability in the Application of the Problem-Based Mathematics Learning Model Based on Batak Culture (PBM-B3)

After learning to use the PBM-B3 model on the material of picture patterns and number patterns, a test was given to assess the students' mathematical creative thinking abilities. The students' answer sheets were collected and corrected based on the scoring guidelines, which assessed four indicators of creative thinking: fluency, flexibility, originality, and detail/elaboration. Based on the corrected mathematical creative thinking ability test results, the students' mathematical creative thinking ability level is presented in **Table 2**.

Table 2. Results of Students' Creative Thinking Ability Test

No	Value Interval	Number of Students	Percentage (%)	Assessment Category
1	0 ≤ SKBK < 55	0	0	Very Low
2	55 ≤ SKBK < 65	4	20	Low
3	65 ≤ SKBK < 80	9	45	Moderate
4	80 ≤ SKBK < 90	4	20	High
5	90 ≤ SKBK ≤ 100	3	15	Very high
	Highest Value	**94**		
	Lowest Value	**59**		
	Range	**35**		
	Average Value	**75,35**		
	Standar Deviasi	**11,29**		
	Nilai Tertinggi	**94**		

Sumber: Penelitian 2024

Table 2 shows that the percentage of students' mathematical creative thinking ability in the very high category tends to be lower than that of students in the high, medium, and low categories. Based on the results of the mathematical creative thinking ability test on students, it was found that the level of students'

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mathematical creative thinking ability was spread across four categories. The diagram of the results of the students' mathematical creative thinking ability test can be seen in **Figure 2**.

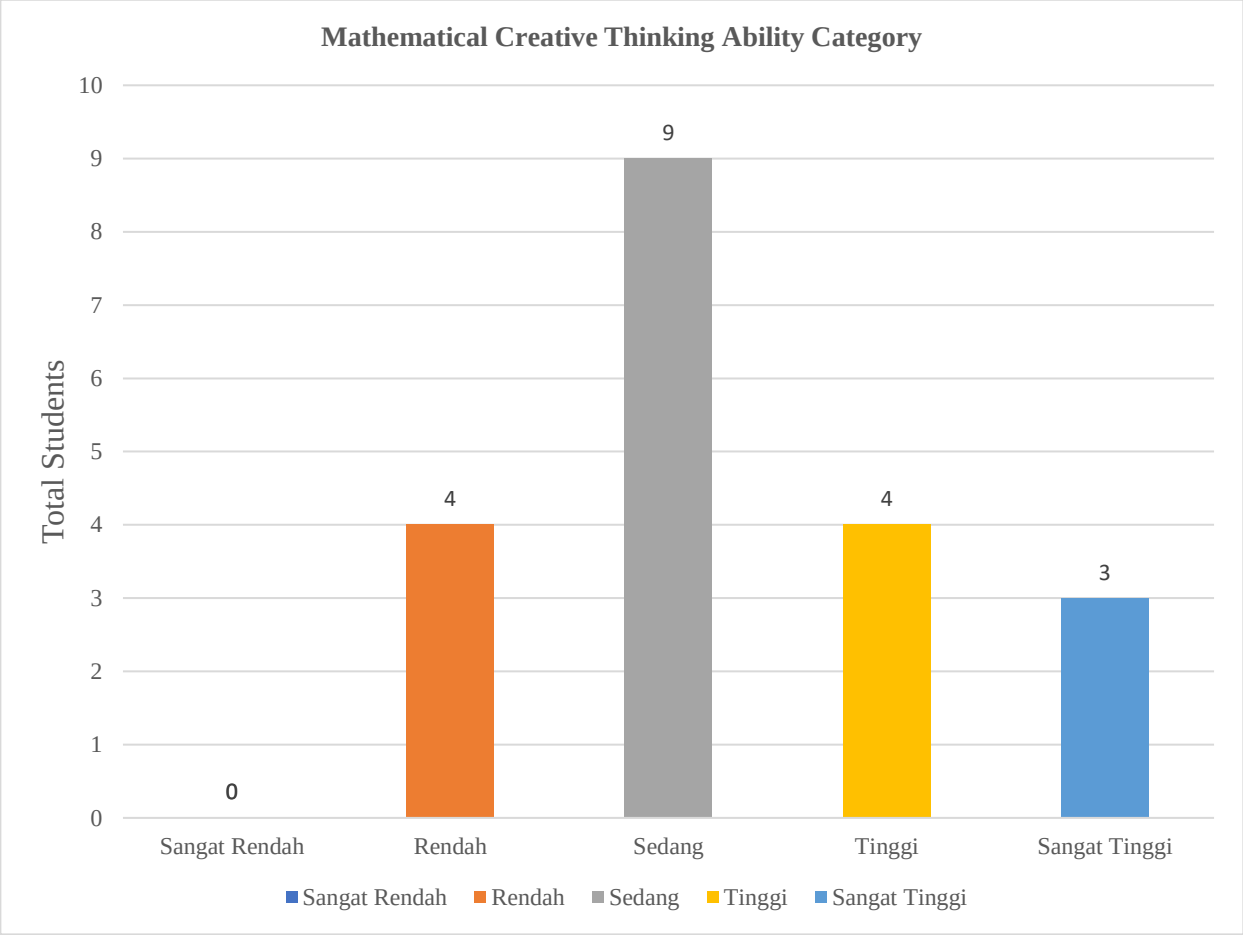

Figure 2. Diagram of Students' Mathematical Creative Thinking Ability Test Results
Source: Research 2024

Based on **Figure 2**, of the 20 students who took the mathematical creative thinking ability test, the group of students with a 'moderate' level of mathematical creative thinking ability had the highest proportion, namely 45%, followed by the 'high' and 'low' levels of mathematical creative thinking ability, namely 20% each. This shows a positive result, where the results of the mathematical creative thinking ability test of students at SD Negeri 030280 Sidikalang are in the 'moderate' category with a score of 40.15. Previous research has revealed that if most of the research subjects are in the 'less creative' category, they only meet one or two criteria for creative products (Siswono, 2011). On the other hand, the test results of students who fall into the "moderate" category can mean that the students are pretty skilled at creative thinking.

Differences in mathematical creative thinking abilities among students can be explained through various perspectives put forward by experts. First, from a cognitive perspective, psychology experts such as Guilford in the book "*The Nature of Human Intelligence " emphasize* that creativity involves several dimensions such as fluency, flexibility, originality, and elaboration. Each learner has different cognitive development, which is greatly influenced by their learning experiences. Then, according to Vygotsky's development theory in the book "*Mind in Society: The Development of Higher Psychological Processes,*" It is stated that learning experiences involving social interaction and support from adults can accelerate the development of creative thinking. Students often involved in activities that stimulate creativity, such as

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problem solving or open discussions, tend to have higher creative thinking skills than students who lack such experiences.

The second perspective that influences students' mathematical creative thinking is the environment. Csikszentmihalyi, an expert in the field of positive psychology, in his book "*Creativity: Flow and the Psychology of Discovery and Invention*", argues that creativity does not only depend on the individual, but also on a supportive environment. Students who grow up in an environment that appreciates creative thinking and provides emotional support tend to be more confident in exploring new ideas. Conversely, students in an environment that is less supportive or limits freedom of thought may feel afraid to experiment, so their creative thinking abilities do not develop optimally. This follows the statement that a less good environment will provide less intelligence and intellectual development, and vice versa (Yustikarini, 2024).

Third, **learning styles and individual preferences** also cause differences in creative thinking abilities. According to Gardner's theory of multiple intelligences, each learner has a dominant intelligence that influences how they learn and think. Learners with more creative intelligence, such as spatial or linguistic intelligence, may find it easier to develop original ideas. Conversely, learners with more logical or analytical intelligence may be more structured in their thinking, thus tending to produce fewer innovative ideas.

Fourth, **Motivation**. Motivation is also an important factor in the development of creativity. This is because motivation can affect the entire learning process, from implementing learning activities, completing assignments, to learning habits in students (Rosyiddin *et al*, 2023). Strengthened by the theory of Amabile, an expert in the psychology of creativity in his book "*The Social Psychology of Creativity*", which states that students who have intrinsic motivation, namely the drive to engage in creative activities because of personal interest, tend to show higher creative thinking skills. These students enjoy the creative thinking process more and feel free to experiment. On the other hand, students who are more motivated by external factors, such as grades or praise, may be less focused on the creative process and more on the result, which can hinder their creativity development.

Lastly, **culture**. Culture also plays a role in influencing learning outcomes, which then triggers students' creative thinking skills (Arifin *et al*., 2023; Asmara *et al*., 2022). Internalizing a culture into learning is a strategy for developing students' thinking skills by linking learning to real-life situations, so that students can link knowledge to their daily lives (Hariri & Mulyani, 2016). Cultures emphasizing conformity and stability may be less conducive to creativity, as students tend to follow existing thought patterns and are not encouraged to think outside the box. In contrast, creativity is more valued and encouraged in cultures that value innovation and freedom of thought, and students are more likely to develop new ideas. Thus, differences in creative thinking abilities among students result from the interaction of various internal and external factors. Understanding these factors can help educators create learning environments that are more conducive to developing the creativity of all students.

Obstacles for Students in Completing the Mathematical Creative Thinking Ability Test

The obstacles students face in completing the mathematical creative thinking ability test in PBM-B3 are presented as a narrative based on the triangulation of data from the answer process and interview results. The following describes the analysis of students' difficulties in developing their mathematical creative thinking abilities, with categories of very high, high, medium, and low ability levels.

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Students with a Very High Category of Mathematical Creative Thinking Ability

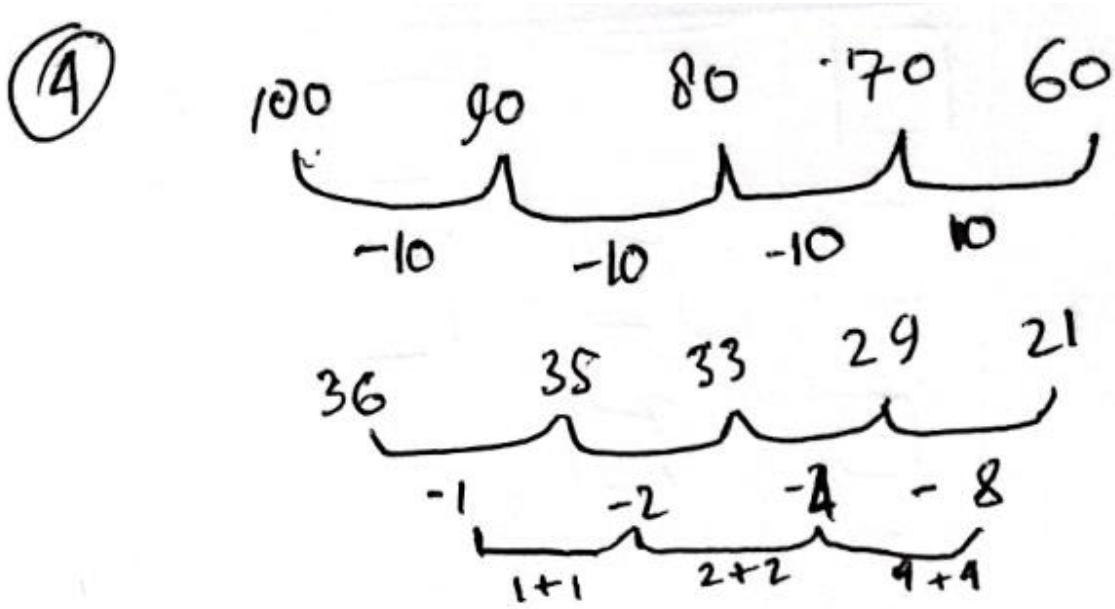

Figure 3. Student's Answer Sheet with Code S-17 for Question Number 4
Source: Author's Documentation 2024

Based on the answer sheets and interview transcripts of students with very high abilities, in the creative thinking indicators, namely fluency, flexibility, originality, and elaboration, students did not experience any difficulties (**Figure 3**). Students understand the questions and how to answer them, even though they only answer them in two ways. However, there is originality, namely being able to do the questions in a way that is different from others or has never been taught before by the teacher. So these students have understood the facts, concepts, principles, and procedures. This is in line with previous research that students with level four creative mathematical thinking skills (very creative) have been able to fulfill the four indicators of creative mathematical thinking (Muslimah & Listiyani, 2022).

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Students with a High Category of Mathematical Creative Thinking Ability

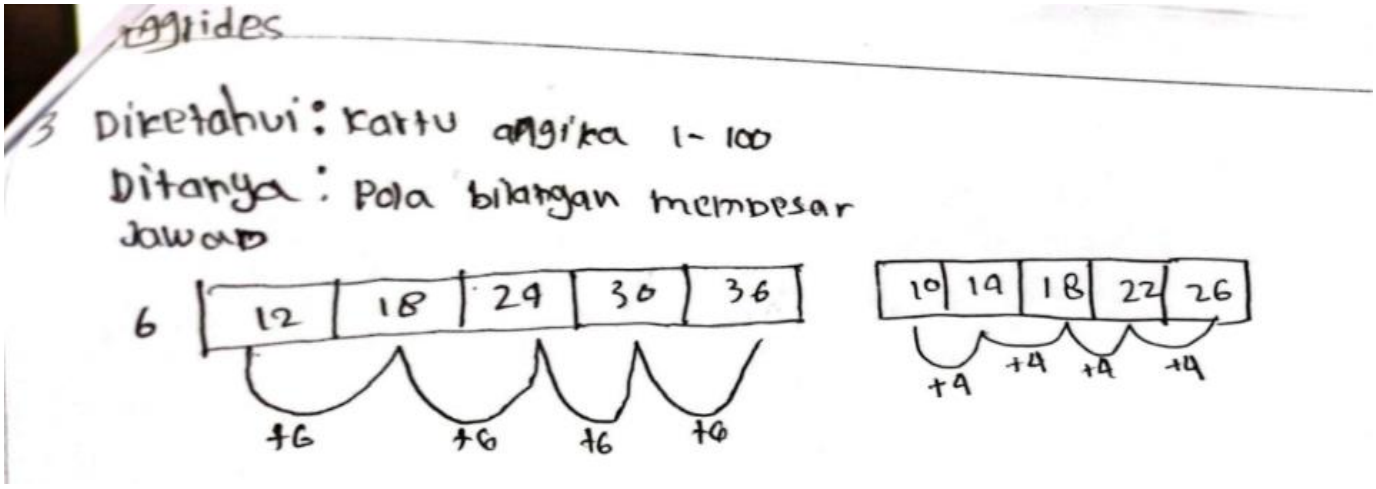

Figure 4. Student's Answer Sheet with Code S-14 for Question Number 3
Source: Author's Documentation 2024

Based on the answer sheets and interview transcripts of high-ability students (**Figure 4**), it was found that students had difficulty in the originality indicator, where students were not yet able to connect Mathematics with problem solving, so that students had difficulty providing new ideas that were different from learning in class. This shows that students have difficulty understanding the basic principles of problem solving in Mathematics. Previous research explains that when students have difficulty in discovery and are not careful when performing arithmetic operations, this is an obstacle for students in applying the principles of Mathematics itself. (Abrar, 2014).

Students with the Medium Category of Creative Mathematical Thinking Ability

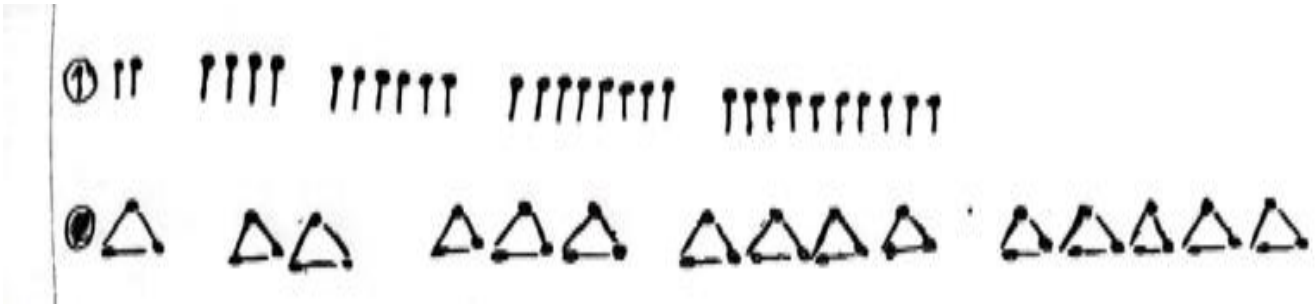

Figure 5. Student Answer Sheet with Code S-8 for Question Number 1
Source: Author's Documentation

Based on the answer sheets and interview transcripts of students with moderate abilities, it was found that students had difficulty with the originality and detail indicators (**Figure 5**). Students have not been able to provide new ideas due to a lack of understanding of the connection between Mathematics and problem solving, so students have difficulty providing new ideas that are different from learning in class. There is also difficulty in understanding the procedures experienced by students in completing the test. Although the answers are correct, students do not include what is known and asked, do not draw conclusions, and do not write down the reasons/methods of the answers given. So, the conclusion is that students struggle with principles and procedures. In other studies, it is explained that the inability of students to provide

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ideas, solve problems from various perspectives, solve problems in their way, and develop something in detail can result in students' difficulty in understanding principles and procedures (Sister *et al*., 2018).

Students with a Low Category of Mathematical Creative Thinking Ability

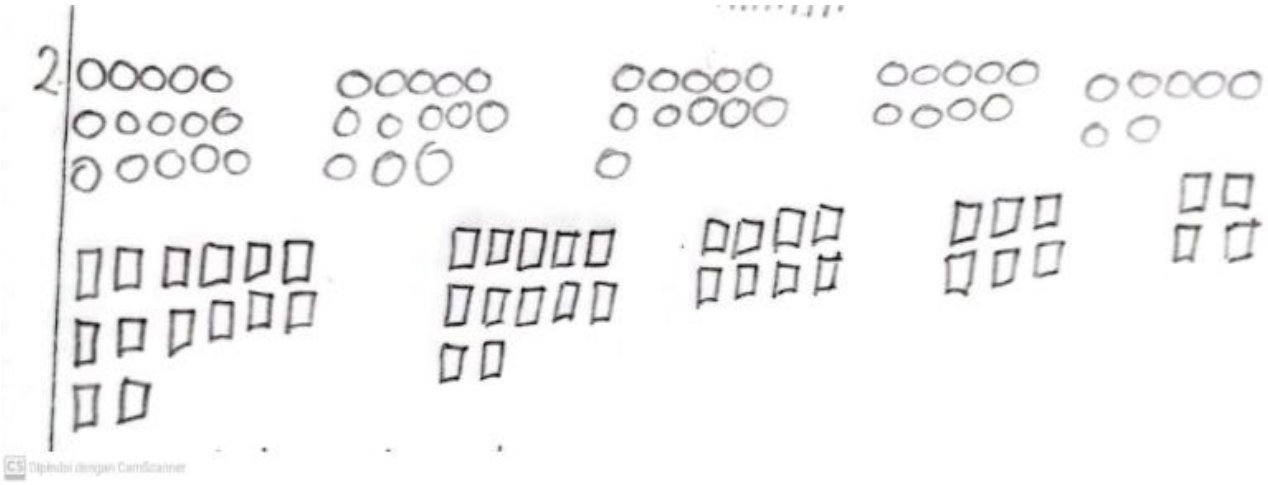

Figure 6. Student's Answer Sheet with Code S-5 for Question Number 2
Source: Author's Documentation

Based on the answer sheets and interview transcripts of low-ability students, it was found that students had difficulty in the indicators of flexibility, originality, and detail (**Figure 6**). Students did not provide multiple ideas for solving a problem differently, even though they knew they could. Students were not yet able to provide new ideas due to a lack of understanding of connecting Mathematics in problem solving, so students had difficulty providing new ideas that differed from learning in class. Students did not include what was known or asked, did not draw conclusions, and did not write down the reasons/methods of the answers given, even though the answers made were correct. So, the conclusion obtained was that students had difficulty with principles and procedures. According to Widdiharto in his book "*Diagnosis Kesulitan Belajar Matematika SMP dan Alternatif Proses Remidinya*", Learning difficulties are students' lack of success in mastering concepts, principles, or problem-solving structures/procedures, even though they have tried to teach them.

The success of learning Mathematics to improve creative thinking must be accompanied by selecting the right learning approach for students (Nurlita & Jailani, 2023). In addition, it is necessary to provide student-centered learning, where students can be directly involved in the teaching and learning. This student-centered learning will help students to be able to think creatively in solving problems (Fajriah & Asiskawati, 2015). The PBM-B3 model, a modification or refinement of the Problem-Based Learning model by considering the characteristics of Mathematics, the objectives of Mathematics learning, and the use of cultural aspects, is one of the learning models that can trigger students' creative thinking. This learning model is centered on students by being directly confronted with various content and context problems directly related to everyday cultural life. Based on the study's results, the PBM-B3 model can positively impact students' learning outcomes to improve their creative thinking skills. The PBM-B3 model, which focuses on learning by solving problems, can significantly improve students' learning outcomes (Marbun *et al*., 2023).

CONCLUSION

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The students' mathematical creative thinking ability on the material of picture patterns and number patterns after the application of the PBM-B3 model, it was found that out of twenty students, there were three students who had very high category mathematical creative thinking ability, namely where students had almost no difficulty in developing and detailing ideas; four students had high category mathematical creative thinking ability, namely where students had difficulty in generating answers that were different from other students, students tended to have difficulty in the principle criteria; nine students had moderate category mathematical creative thinking ability, namely students showed more incredible difficulty, especially in detailing/enriching their ideas and difficulty in providing ideas that were different from the answers of other students, students tended to have difficulty in the principle and procedure criteria; and four students had low category mathematical creative thinking ability, namely students had difficulty in several indicators of creative thinking, namely flexibility, originality, and detail, students tended to have difficulty in the principle and procedure criteria. Furthermore, the group of students with a 'moderate' level of mathematical creative thinking ability has the highest proportion, followed by the 'high' and 'low' levels of mathematical creative thinking ability.

AUTHOR'S NOTE

The author declares that there is no conflict of interest regarding the publication of this article and confirms that the data and content are free from plagiarism.

REFERENCES

Abrar, A. I. P. (2014). Kesulitan siswa SMP belajar konsep dan prinsip dalam Matematika. *Al-Khwarizmi: Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam, 2*(1), 59-68.

Almasri, F., Hewapathirana, G. I., Alhashem, F., Daniel, C. E., & Lee, N. (2023). The effect of gender composition and pedagogical approach on major and non-major undergraduates biology students' achievement. *Interactive Learning Environments, 31*(10), 7287-7319.

Amelia, E., Rapi, M., & Taufiq, A. U. (2024). Pengaruh model pembelajaran ercore terhadap kemampuan berpikir kreatif siswa pada materi perubahan lingkungan. *Prosiding Seminar Nasional Biologi, 4*(1), 725-736.

Anindayati, A. T., & Wahyudi, W. (2020). Kajian pendekatan pembelajaran STEM dengan model PjBL dalam mengasah kemampuan berpikir kreatif matematis siswa. *Eksakta: Jurnal Penelitian dan Pembelajaran MIPA, 5*(2), 217.

Arga, H.S.P. (2022). Improvement of creative thinking ability of elementary teacher education students in utilizing traditional games in social studies learning. *Department of Education, 7*(2), 235-250.

Arifin, A., Santoso, G., Kudori, M., & Tugiman, T. (2023). Peran budaya dan bahasa dalam membentuk identitas diri melalui berkebhinekaan global, kreatif dan kritis di kelas 5. *Jurnal Pendidikan Transformatif, 2*(4), 438-463.

Asmara, A. S., Fitri, A., Anwar, A. S., & Muhtarulloh, F. (2022). Peningkatan kemampuan berpikir kreatif dengan konteks budaya lokal Karawang menggunakan realistic Mathematics education pada masa pandemi. *SJME (Supremum Journal of Mathematics Education), 6*(1), 85-92.

Fadilah, N., Dewi, I., & Ahyaningsih, F. (2024). Relationship between Mathematics education philosophy and traditional Malay culture in Serampang 12. *Inovasi Kurikulum, 21*(4), 2331-2346.

https://doi.org/10.17509/jik.v22i1.73719

Faelasofi, R. (2017). Identifikasi kemampuan berpikir kreatif Matematika pokok bahasan peluang. *Jurnal e-DuMath*, *3*(2), 155-163.

Fajriah, N., & Asiskawati, E. (2015). Kemampuan berpikir kreatif siswa dalam pembelajaran Matematika menggunakan pendekatan pendidikan Matematika realistik di SMP. *Edu-Mat: Jurnal Pendidikan Matematika, 3*(2), 157-165.

Fauzi, K., Amin, M., Dirgeyase, I. W., & Priyatno, A. (2019). Building learning path of mathematical creative thinking of junior students on geometry topics by implementing metacognitive approach. *International Education Studies*, *12*(2), 57-66.

Firmando, H. B., & Agama, S. (2021). Kearifan lokal sistem kekerabatan dalihan na tolu dalam merajut harmoni sosial di kawasan Danau Toba. *Aceh Anthropological Journal, 5*(1), 16-36.

Hariri, A. I., & Mulyani, A. (2016). Penerapan pembelajaran berbasis sains budaya lokal ngaseup pada konsep sistem reproduksi manusia untuk meningkatkan keterampilan berfikir kritis siswa kelas XI Maja. *Scientiae Educatia: Jurnal Sains dan Pendidikan Sains*, *5*(1), 1-14

Hasanah, U., & Putra, R. W. Y. (2017). Analisis proses berpikir kreatif dalam memecahkan Matematika ditinjau dari tipe kepribadian rational dan artisan. *Prosiding Seminar Nasional Matematika dan Pendidikan Matematika 2017 UIN Raden Intan Lampung, 1*(1), 137-149.

Ibrahim, & Widodo, S. A. (2020). Advocacy approach with open-ended problems to mathematical creative thinking ability. *Infinity Journal, 9*(1), 93-102.

Jumriana, L., Lutfin, N. A., & Mutmainna, M. (2022). Hubungan antara kemampuan berpikir kreatif dengan kemampuan pemecahan masalah Fisika peserta didik. *Phydagogic: Jurnal Fisika dan Pembelajarannya*, *5*(1), 48-55.

Marbun, E. J., Simanjorang, M. M., & Sinaga, B. (2023). The influence of batak culture problem based learning models to junior high school students' computational thinking ability. *Jurnal Analisa, 9*(2), 162-174.

Maryani, N., Marlina, N., & Amelia, R. (2019). Upaya meningkatkan kemampuan berpikir kreatif siswa SMK Kelas X melalui pendekatan open ended pada materi trigonometri. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 3*(1), 21-27.

Muslimah, U., & Listiyani, E. (2022). Analisis kemampuan berpikir kreatif matematis peserta didik SMP kelas VII pada pembelajaran daring. *Jurnal Pedagogi Matematika*, *8*(1), 26-38.

Nurlita, A., & Jailani, J. (2023). Pembelajaran Matematika menggunakan pendekatan kontekstual untuk meningkatkan kemampuan berpikir kreatif dan kolaborasi siswa. *Aksioma: Jurnal Program Studi Pendidikan Matematika, 12*(1), 771-777.

Nurlita, M., Azis, A., & Faroq, L. A. (2023). Efektivitas penerapan pendekatan open-ended ditinjau dari kemampuan berpikir kreatif pada siswa kelas VIII. *Jurnal Tambora, 7*(1), 213-219.

Patmawati, K., Puspitasari, N., Mutmainah, S. N., & Prayitno, B. E. (2019). Profil kemampuan berfikir kreatif ditinjau dari kemampuan akademik mahasiswa. *Edu Sains: Jurnal Pendidikan Sains dan Matematika, 7*(2), 11-18.

Rasnawati, A., Rahmawati, W., Akbar, P., & Putra, H. D. (2019). Analisis kemampuan berfikir kreatif matematis siswa SMK pada materi sistem persamaan linier dua variabel (SPLDV) di kota Cimahi. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 3*(1), 164-177.

https://doi.org/10.17509/jik.v22i1.73719

Rosyiddin, A. A. Z., Fiqih, A., Hadiapurwa, A., Nugraha, H., & Komara, D. A. (2023). The effect of interactive PowerPoint media design on student learning interests. *Edcomtech: Jurnal Kajian Teknologi Pendidikan, 8*(1), 12-24.

Sari, R. F., & Afriansyah, E. A. (2022). Kemampuan berpikir kreatif matematis dan belief siswa pada materi persamaan dan pertidaksamaan linear. *Plusminus: Jurnal Pendidikan Matematika, 2*(2), 275-288.

Siallagan, F., Sinaga, B., & Rajagukguk, W. (2021). Analisis kemampuan penalaran dan berpikir kreatif matematis siswa dalam pembelajaran penemuan terbimbing. *Paradikma Jurnal Pendidikan Matematika*, *14*(1), 68-74.

Sister, D., Syahputra, E., & Sinaga, B. (2018). Analisis kesulitan berpikir kreatif matematis siswa pada penerapan model Problem-Based Learning (PBL). *Paradikma Jurnal Pendidikan Matematika, 11*(1), 1-5.

Siswanto, R. D., & Ratiningsih, R. P. (2020). Korelasi kemampuan berpikir kritis dan kreatif matematis dengan kemampuan pemecahan masalah matematis materi bangun ruang. *Anargya: Jurnal Ilmiah Pendidikan Matematika, 3*(2), 96-103.

Siswono, T. Y. E. (2011). Level of student's creative thinking in classroom mathematics. *Educational Research and Review, 6*(7), 548-553.

Situmorang, A., Napitupulu, E., & Wahyuningrum, E. (2023). Pengaruh pendekatan pembelajaran Matematika realistik dan motivasi belajar terhadap kemampuan berpikir kreatif siswa kelas V SD. *Jurnal Teknologi Pendidikan (JTP), 16*(1), 1-9.

Yanti, Y., Sumarni, S., & Adiastuty, N. (2019). Pengembangan perangkat pembelajaran pada materi segiempat melalui pendekatan open-ended untuk meningkatkan kemampuan berpikir kreatif. *Jurnal Edukasi dan Sains Matematika (JES-MAT), 5*(2), 145.

Yolanda, S. B., Mahardika, I. K., & Wicaksono, I. (2021). Penggunaan media video sparkol terhadap kemampuan berpikir kreatif siswa pada pembelajaran IPA di SMP. *Jurnal Pendidikan Fisika, 9*(2), 189-203.

Yustikarini, R. (2024). Curriculum design to improve adolescent social-emotional skills. *Inovasi Kurikulum, 21*(1), 191-202.

Zakiah, N. E., Fatimah, A. T., & Sunaryo, Y. (2020). Implementasi project-based learning untuk mengeksplorasi kreativitas dan kemampuan berpikir kreatif matematis mahasiswa. *Teorema: Teori dan Riset Matematika, 5*(2), 285-293.

https://doi.org/10.17509/jik.v22i1.73719