Systematic Literature Review: Creative Thinking Ability based on Mathematical Anxiety Level in Problem Based Learning with Metacognitive Approach

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Abstract

Creative thinking skills are part of life skills that need to be developed, especially in the face of the information age and an increasingly competitive atmosphere. Creative thinking skills can also improve students' higher-order thinking skills, where students' higher-order thinking skills in Indonesia are still relatively low. The low level of students' creative thinking skills can also be influenced by students' anxiety levels. The existence of the influence of students' anxiety levels on higher order thinking skills can be overcome by the application of the right learning model, one of which is the Problem Based Learning model with a Metacognitive approach. The objective of this study was to determine the relationship between students' creative thinking skills in terms of students' mathematical anxiety level in the Problem Based Learning model with a metacognitive approach. The research is using Systematic Literature Review (SLR), and was conducted by identifying, analyzing, and evaluating all articles obtained. The articles used in this study are articles from the last eight years (2015-2022). The results showed that there is a relationship between students' creative thinking ability and students' anxiety level in the Problem Based Learning learning model with a metacognitive approach.

Keywords: Creative Thinking Ability, Mathematical Anxiety, Problem Based Learning, Metacognitive Approach

1. Introduction

Education is one of the most important aspects of daily life. Indonesian Law No. 20 Year 2003 on the National Education System (Sisdiknas Law) states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential. According to Indonesian Law No. 20 Year 2003, the function of National Education is to develop the ability to develop the character and civilization of a dignified nation in the context of the nation's intellectual life. One of the contexts of the nation's intellectual life is related to high order thinking skills. Higher order thinking skills are thinking processes that go beyond memorizing and retelling known information. (Solehuzain & Nur, 2017). One part of higher order thinking skills is creative thinking skills.

The ability to think creatively is a fundamental ability that needs to be possessed by every individual in dealing with problems. Sumarmo (2013) stated that the ability to think creatively is part of the life skills that need to be developed, especially in the face of the information age and the increasingly tight competitive atmosphere. Torrance, et al. (in Wang, 2011: 4) stated that the creativity domain consists of four components, namely fluency, flexibility, originality, and elaboration. This creative thinking ability can be developed through math.

Mathematics is the basic science of various sciences that underlie the development of modern technology, which has an important role in advancing human thinking. Mathematics is a science that studies the regularity of structure, concepts that are arranged systematically, ranging from simple to complex concepts. Mathematics not only works in the field of mathematics, but also works in various fields such as medicine, engineering, natural sciences, and even social sciences. With this statement, it should be underlined that mathematics is an important science, which needs to be learned by students.

But in reality, currently there are still many assumptions from students who think that math is a difficult science. This can lead to various kinds of responses from students, both positive and negative,

which later students can experience symptoms of learning anxiety towards learning math. One of the factors that causes students to have difficulty in solving math problems is the math anxiety factor.

Anxiety is a word that comes from the word anxious. According to the Big Indonesian Dictionary, the word anxious means uneasy (due to worry, fear). Anxiety is an emotional condition with a sense of discomfort in a person (Annisa & Ifdil, 2016). Anxiety in learning mathematics or student mathematical anxiety can occur if students have feelings of worry, anxiety, and even fear at a high enough level when given a math problem or problem. Lutfiyah et al. (2019) revealed that mathematical anxiety has an important role in influencing students' mathematical abilities.

With that, a learning model is needed that can make students active and can encourage students' involvement in learning, provide new ideas, dare to express opinions, and have good mathematical thinking skills. One of the learning models that can support this is the application of the Problem Based Learning model.

Fadhilah et al., (2015) stated that the Problem Based Learning learning model is better than the direct learning model. This is also supported by the results of his research which concluded that the Problem Based Learning learning model can improve students' mathematical abilities, one of which is the ability to think creatively, and also provide better mathematics learning outcomes than the direct learning model for each student's anxiety level. To support the Problem Based Learning model in an effort to reduce students' anxiety levels, the learning model can be combined with a metacognitive approach.

The metacognitive approach is an approach in an effort to realize cognition and foster confidence through questions. The metacognitive approach has the main feature that the teacher asks questions in the form of questions regarding problem understanding and problem solving. Students will later use intellectual skills in organizing rules when responding to problems, so that students will be actively involved in the thinking process (Fisher, 2016). From this statement, the metacognitive approach can be implemented to increase self-confidence, so that it can reduce students' mathematical anxiety.

The metacognitive approach in mathematics learning can be implemented in various ways, as long as the core of the learning is to evaluate students' metacognition through the provision of metacognitive questions. One of them is by integrating a metacognitive approach to the Problem Based Learning learning model. With this, in this research, it will be studied about students' creative thinking skills in terms of students' mathematical anxiety level in the Problem Based Learning learning model with a metacognitive approach.

2. Method

The research method used in this study is the Systematic Literature Review (SLR) method. According to (Kitchenham et al., 2009) Systematic Literature Review (SLR) is a selective methodological review in obtaining research results. According to Shuttleworth (Marasabessy & Hasanah, 2021) literature review does not only mean reading the literature, but more towards an in-depth and critical evaluation of previous research on a topic. A research method that summarizes the results of primary research to provide more comprehensive and balanced facts. With this method, the researcher reviewed and identified journals that were found to be related to the specified theme. The purpose of SLR is to identify, review, evaluate, and interpret the various studies available according to the relevant topic. (Triandini et al., n.d.).

3. Result and Discussion

The Problem Based Learning (PBL) learning model with a metacognitive approach is one alternative model that can be applied so that learning can run actively and effectively. The Problem Based Learning (PBL) learning model with a metacognitive approach provides opportunities for students to be able to know their abilities, so that they can consciously try to improve their abilities.

The data on the results of research on creative thinking skills in terms of learning anxiety in the Problem Based Learning (PBL) learning model with a metacognitive approach, from 21 articles found, are presented in the following table.

Table 3. 1 Research Result

Author (Year)	Journal Type	Research Results
Frisman Saleh, Anwar Bey, Kodirun (2018)	Journal of Mathematics Education	The results of research conducted by researchers on students in grades X MIPA and X IPS state that there is no relationship between the level of anxiety in facing exams and math learning outcomes, which means that the diversity of students' math learning achievements is determined by the level of anxiety in facing exams.
Pratiwi, Linda Ajeng, Dwijanto, Kristina Wijayanti (2019)	Proceeding of National Seminar on Mathematics	The results of mixed method research in the article are that students with upper or high levels of mathematical anxiety tend to be less able to solve math problems according to indicators of creative thinking ability. Meanwhile, students with lower or low anxiety levels tend to be able and able to solve math problems according to the indicators of creative thinking ability well.
Shinta Silviana, Kartinah, Nurina Happy (2019)	National Seminar on Mathematics and Mathematics Education (SENATIK)	The results concluded that the analysis of students' mathematical creative thinking skills in terms of mild mathematics anxiety, students only fulfill the creative thinking aspects of fluency and flexibility, have not fulfilled the novelty aspect.
Disti Pratiwi, Endang Wahyuningrum, Sandra Sukumaning Adji (2019)	Journal of Education	The results showed that subjects with low math anxiety could fulfill all three aspects of creative thinking, namely fluency, flexibility and novelty. Meanwhile, subjects with moderate math anxiety were only able to fulfill the aspects of fluency and flexibility.
I Gusti Agung Ngurah Trisna Javantika, Nyoman Parmithi, Desak Nyoman Diah Purwaningsih (2020)	Emasains Journal: Journal of Math and Science Education	From the research results in this article, there is an increase in learning outcomes and a reduction in students' mathematical anxiety after the implementation of the Problem Based Learning model.
Ana Setiani (2016)	Journal of Mathematics and Mathematics Education	The results showed that the anxiety level of students who used Problem Based Learning decreased compared to students who used expository learning.

Umi Fadlilah, Budi Usodo, Sri Subanti (2015)	Journal of Mathematics Learning	The results of research in the form of experimental research in this article are that students who are subjected to the PBL learning model will be able to provide good learning achievement, and students who have good learning achievement tend to have low levels of math learning anxiety, so with the PBL learning model, it will help reduce the level of math learning anxiety which later students can provide good learning achievement.
Amarta Prayuti, Tian Abdul Aziz, Makmuri (2021)	Jakarta Journal of Mathematics Education Research	The results of the literature study conducted by the researcher state that the application of the Problem Based Learning model in learning will be able to improve students' mathematical abilities. In addition, it can also increase student intelligence.
Restu Cahyaningsih, M.Asikin (*2015*)	Journal of Educational Nalar	The results stated that students' creative thinking skills using PBL were better than the PMH approach and conventional learning.
Ari Septian, Riki Rizkiandi (2017)	Journal PRISMA Suryakancana University	The results stated that the mathematical creative thinking skills of students who received problem-based learning tended to be better than those of students who received conventional learning.
Anik Handayani, Henny Dewi Koeswanti (2021)	Basicedu Journal	The results of the analysis in this study concluded that the PBL learning model was able to improve students' creative thinking.
Ersam Mahendrawan, Ihat Solihat, Maghfiroh Yanuarti (2022)	Journal of Cendekia: Journal of Mathematics Education	The results showed that the PBL LKS approach was more effective than the conventional approach.
Agusmanto J.B Hutauruk (2016)	Proceedings of the National Seminar on Mathematics and Mathematics Education	The metacognitive approach is a learning approach that encourages students to know what they think, what they have, and what they need to get in order to produce new and better knowledge.
Putri Dwi Pertiwi, Heni Pujiastuti, Maman Fathurrohman (2022)	Educative: Journal of Educational Sciences	The results of the study state that the metacognitive approach can be applied to various learning models, one of which is the Problem Based Learning learning model. The implementation of the metacognitive approach in mathematics learning can also be done to improve students' mathematical abilities.

Reza Dea Fitaloka (2022)	Skripsi	The results of the study state that there is an effect of the Problem Based Learning (PBL) learning model with a metacognitive approach to students' mathematical abilities. With this, students' mathematical abilities can improve.
Mawar Nurani (2017)	Skripsi	The results stated that there was a relationship between mathematical anxiety and metacognitive awareness.
Linda Ramadhanty Januar, Purwanto, Susiswo (2022)	Journal of Scholarship: Journal of Mathematics Education	The results of the study state that students with low levels of math anxiety are able to solve math problems well, by using metacognitive strategies to the maximum which results in success in solving math problems.
Kobe Desender, Delphine Sasanguie (2021)	Psychological Research	The results stated that high metacognitive regulation can overcome the detrimental effects of students' mathematical anxiety. In addition, the researchers also stated that students with high levels of anxiety can predict the types of math problems they can solve well.
Bayu Putra Irawan (2020)	Journal of Mathematics Education: Judika Education	Based on the research conducted, the results concluded that the implementation of mathematics learning with a metacognitive approach is effective for improving creative thinking skills.
Budi Setiaji, Hepsi Nindiasari, Aan Hendrayana (2019)	Journal of Authentic Research on Mathematics Education (JARME)	The results of the study in general state that the learning outcomes of students who use a metacognitive learning approach are higher than those of students who get expository learning, both in terms of achievement and improvement in ability.
NE Mawaddah, Kartono, Hardi Suyitno (2015)	Unnes Journal of Mathematics Education Research	The results showed that students' mathematical creative thinking ability in the class subjected to the learning model with a metacognitive approach was better than students in the expository class. There is a positive influence of metacognition and process skills on creative thinking ability.

3.1 Problem Based Learning Model with Metacognitive Approach

Prayuti et al., (2021) stated that the Problem Based Learning model is a learning model that focuses on solving problems related to everyday life. In the literature study research conducted by Pertiwi et al., (2022) there was an integration of the metacognitive approach with several learning models, one of which was Problem Based Learning.

In a study conducted by Bayu Putra Irawan (2020), the results of the study concluded that mathematics learning with a metacognitive approach is effective for improving

creative thinking skills. Desender & Sasanguie (2022) stated in his research that high metacognitive regulation can overcome the detrimental effects of students' mathematical anxiety. So it can be concluded that the Problem Based Learning model with a metacognitive approach will be better than just applying the Problem Based Learning model alone in its role to improve creative thinking skills and its effect on students' mathematical anxiety.

3.2 Creative Thingking Ability

Handayani & Koeswanti (2021) stated that creative thinking ability is a process used to generate an idea or ideas for problem solving. Mahendrawan et al., (2022) stated that the aspects of creative thinking ability are fluency, flexibility, and elaboration. Fluidity is thinking by being able to present a variety of different points of view. Originality is the ability to think to come up with new and unusual ideas. While elaboration is the ability to think by using detailed or detailed ways. In addition, Pratiwi W et al. (2019) also stated that the indicators of mathematical creative thinking ability are fluency, flexibility, and novelty.

At the school level, the ability to think creatively is trained in learning mathematics through the provision of appropriate questions. In general, improving creative thinking skills can be done through problem solving, including solving problems in open questions. Open math problems can be the basis for developing students' creative thinking skills in mathematics (Mahendrawan et al., 2022).

3.3 Student Mathematical Anxiety

Mawar Nurani (2017) states that mathematics anxiety is a student's emotional state characterized by fear, tension, anxiety, and concern about mathematics lessons in manipulating numbers and solving mathematical problems. Mahmood & Khatoon (2011) stated that the indicators of math anxiety experienced by a person are (1) It is difficult to be ordered to do math; (2) Avoiding math class; (3) Feeling physically ill; (4) Unable to do math test questions. Lutfiyah et al. (2019) revealed that mathematical anxiety has an important role in influencing students' mathematical abilities.

3.4 Students' Creative Thinking Ability in terms of Students' Mathematical Anxiety in the Problem Based Learning learning model with a Metacognitive Approach

From the description of the three things above, it can be connected that the application of the Problem Based Learning (PBL) learning model can improve mathematical abilities and reduce students' anxiety levels (Fadlilah et al., 2015), as well as increase students' creative thinking abilities (Handayani & Koeswanti, 2021). Likewise with the metacognitive approach, students' mathematical abilities will tend to be better in their improvement (Setiaji et al., 2019). The metacognitive approach is also effective for increasing creative thinking skills (Irawan, 2020), and can also overcome the detrimental effects of students' math anxiety (Desender & Sasanguie, 2022).

The Problem Based Learning model with a metacognitive approach includes the following learning steps, (1) Group formation. The teacher divides students into groups. At the beginning of this group formation, the learning objectives are conveyed to students so that students understand the purpose of the learning; (2) Providing problems. The teacher provides problems in everyday life related to what students will learn; (3) Identifying problems. Students choose the best way to solve the problem. The teacher acts as a facilitator; (4) Problem solving. The teacher encourages students to actively and independently gather information from various sources to solve problems; (5) Presentation of results. Students present the results of the discussion in front of the class; (6) Evaluation. This step is intended to help students analyze and evaluate their own results and processes (Elita et al., 2019).

In quantitative research conducted by Handayani & Koeswanti (2021) there is an increase in the percentage of applying the Problem Based Learning model to improve students' mathematical creative thinking skills compared to learning that does not apply the Problem Based Learning model.

So that with the Problem Based Learning learning model with a metacognitive approach it can reduce students' anxiety levels which will affect students' mathematical abilities. By reducing the level of student anxiety, students' mathematical abilities, one of which is the ability to think creatively mathematically students can increase, so that student achievement also increases.

4. Conclusion

Based on the results of research using the SLR method, it can be stated that there is a relationship between students' mathematical abilities, one of which is the ability to think creatively with students' anxiety levels. The higher the level of student anxiety, the lower the ability to think creatively which affects learning achievement. Vice versa. So that in learning, a learning model is needed that can have an influence on students' mathematical abilities, one of which is students' creative thinking skills, namely the Problem Based Learning learning model combined with a metacognitive approach.

With this, it can be concluded that the Problem Based Learning learning model with a metacognitive approach is an effective learning model to be able to improve students' mathematical abilities, and can also reduce students' anxiety levels.

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