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Study Literature Review: Mathematical Problem Solving Ability through *Problem Based Learning* Model assisted by *Math City Map Application*

Astiani Astiani
Universitas Negeri Semarang
Sekaran, Kec. Gn. Pati, Kota Semarang, Jawa Tengah 50229
astianiatik742@students.gmail.com

Abstract : *Problem solving is a planned process that needs to be carried out in order to obtain a solution to a particular problem that requires systematic resolution steps. Systematic methods are used in the learning process to solve problems or face challenges needed in everyday life. The research method used is the Literature Review System with writing stages, namely data planning, screening, extraction, analysis. Search literature studies using google scholar data base using the Publish or Perish application. The use of the Math City Map approach can affect the problem-solving ability of students in mathematics learning. The use of the Math City Map approach helps learners understand and solve math problems better and effectively develop problem-solving skills. Learning outside the classroom using MCM applications provides a more immersive and challenging experience for students, helps them apply knowledge, and improves social and personal skills.*

Keyword: *Math City Map, Problem Based Learning, Problem Solving Ability*

INTRODUCTION

Mathematics has become a part of the culture used for various purposes and analyses of a creative nature. The mathematical paradigm is described as the ability to think and the tools to generate innovations during development. Mathematics learning has always been associated with education because one can only gain understanding and skills of mathematics if they go to school. Mathematics has always been associated with technological developments, as shown by the industrial revolution 4.0 for mathematics and its education. This is not something new as mathematics has been involved in technological developments since the advent of computers. The development of technology is also influenced by the role of mathematics as a tool that demands more thinking in improving critical, logical, systematic, and creative thinking skills. For this reason, there needs to be an effort to create learning about the capabilities of this industrial revolution era, namely the 4Cs: critical, creative, communication, and cooperation. Structuring technology-based mathematics learning is a challenge.

Math City Map is a GPS-based cell phone app that helps with trail math (Ludwig & Jesberg, 2015). *Math City Map* allows students to solve problems outside the classroom, where problems can be found and raised almost anywhere, and problem ideas can be found and executed easily depending on the student's mathematical ability. Application *Math City Map* has the main objective to convey problems to students and solve them through direct

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* Astiani Astiani, astianiatik742@students.gmail.com

observation. The application also includes the help needed to solve the problem (Adi Nur Cahyono, 2018). So by following the math trail activities assisted by the application *Math City Map* It is expected to improve students' mathematical problem solving skills. *Math City Map* shows the location and outcome of a mathematical problem that will be used as a basis for the problem they will solve (Ismaya, Cahyono, and Mariani 2018).

Mathematical problem solving is an activity that requires an individual to attribute a variety of cognitive actions, including sometimes unusual skills and knowledge, in order to reduce the intensity of lacking relevant representations to support calculations (Lester & Kehle, 2003). In mathematics learning, problem-solving ability is a very important ability that is mastered and understood by students (Anderson, 2009; Chaudhry & Rasool, 2012). Problem solving must relate to unusual real-world situations (Polya, 1957. The right learning model is needed to support learners in improving mathematical problem solving skills. Problem-based learning, also known as problem-based learning, is a learning model that focuses on problems that students face in the real world. Encouraging students' ability to solve problems is the goal of this learning activity. It is expected that the mathematical problem solving ability of learners will be improved by using this problem-based learning model. One of these problem-based learning models is a model that involves learners directly carrying out stages of activities aimed at solving problems using various sources of information and references. Learners don't need to imitate or rely on the way others solve problems.

RESEARCH METHODS

This research uses the method *Literature Review Study* by collecting sources such as scientific articles, papers, websites, and others. The writing process consists of planning, data processing, extraction, and analysis. For the purpose of this study, the Literature Review was used to gather information related to the ability to solve contextual problems in the context of problem-based learning using the Math Trail. In this study, data analysis techniques were used in three stages. First, research is organized by collecting and conducting a review of the literature to be used. Second, combine, which is to combine the results of literature reviews with looking for relationships between literature. Third, identify, that is, find problems contained in the current literature and make the writing interesting to read (Ismaya et al., 2018). With the Publish or Perish app, literature searches are conducted in the Google Scholar database. By limiting articles from 2018 to 2023, the keywords "Math City Map", "Math Trails", and "Problem-solving Ability".

RESULTS AND DISCUSSION

a. Literature Study Analysis Table

Writer	Publisher	Research Results
Exam, Heavy Perninda, Reza Lestari (Vol 4 2022)	Proceedings of the Multidisciplinary National Symposium	Students' critical thinking skills are improved through group applications and fishing inquiry. Therefore, Math City Map Mathematics can help improve students' mathematical literacy and critical thinking skills. (Exam et al., 2023).
Rosanti, Fani Harahap, Amin (Vol 06, 2022)	Journal of Scholars: Journal of Mathematics Education	There was a significant influence on problem-solving skills between the experimental class (using an outdoor math learning approach with Math City Map) and the control class (using the lecture learning method). (Rosanti & Salah, 2022).
Princess, N, Princess, Z Deby Mardikaningsih (Vol 4 2023)	And ProSANDIKA UNIKAL	With the help of the Math City Map Mobile application, the Math Trails problem-based learning model can improve positive attitudes towards mathematics, problem-solving abilities, and mathematical thinking skills of learners (Princess et al., 2023).
Hakim, Arif Rahman Asikin, Mohammad Cahyono, Adi Nur (Vol. 2 2019)	Proceedings of the Postgraduate National Seminar (PROSNAMPAS)	The exciting mobile application of Math City Map will help students improve their math problem solving skills (Hakim et al., 2019).
Cahyono, Adi Nur Ludwig, Matthias	International Congress on Mathematical Education	states learners' involvement and enjoyment in outdoor learning situations and is interested in the use of advanced tools for learning. They practice extracting information from the problems they face and using the mathematical concepts they

		have to solve the problems (Cahyono & Ludwig, 2016).
Desi Andryani Lubis, Ludi Arianto, Iqbal Ma'ruf, Al Ashari, Dan Amidi, Jeid (Vol. 3 2021)	Journal of Educational Integration and Development	The use of the Math City Map application tends to improve the ability of learners to think critically. In addition, the use of this application will improve the ability of students to work together and work together in teams (Desi Andryani Lubis et al., 2021).
Edi, Three Mulyono Nayazik, Akhmad (Vol.3 2019)	Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang	On a map or individual Math Trails exploration point, students can formulate, convey, and solve math problems. To solve problems, Math Trail activities can be done individually or in groups. (Edi & Nayazik, 2019).
Wahyudi, Andi Ardhilah Al-fatiha, Ainayy (Vol.6 2023)	Journal of Mathematics Research and Mathematics Education	Math learning outcomes can be improved by using a problem-based learning model based on this Math City Map application (Wahyudi et al., 2023).
Winarti, E. R. Waluya, S. B. Rochmad Kartono (Vol.3 2019)	Journal of Physics: Conference Series	Performance appraisal with PBL learning using performance appraisal can improve problem-solving skills. At the question comprehension stage, based on the work of students who have excelled, there are 96% better than the previous results, which is only 4%. At the strategy selection stage, the percentage of students who can work correctly is 80% better than before at 20% (Winarti et al., 2019).

1. ***The use of Math City Map affects students' problem-solving abilities in mathematics learning***

Troubleshooting is a planned process undertaken to solve a specific problem that requires systematic resolution steps. To solve problems or face challenges necessary in everyday life. The learning process uses a systematic approach to face challenges in everyday life. Steps to solve problems are needed so that learners are able to solve problems well. Understanding the problem, creating a resolution plan and checking back are the four steps that must be taken to solve a problem, according to Polya. (Winarti et al., 2019).

Research by (Edi & Nayazik, 2019) shows that learning outside the classroom can improve student learning outcomes when learning models are applied *Problem Based Learning* Using the approach *Math Trails* into two cycles. In the first cycle, learners have difficulty solving story problems because they do not understand the commands or steps. Different results between groups may be caused by learners rushing over, using different measurement methods, not understanding the problem well, or not changing units of length. However, when the two-learner cycle improves, the teacher continues to evaluate the learners' learning activities and encourages them to continue participating in the discussion. Math Trails' problem-based learning model has several real or contextual problems that encourage students to improve their ability to solve mathematical problems. This model allows students to find their own solutions to a given problem and encourages them to systematically solve them.

2. ***The Effectiveness of Using Math City Map in developing Mathematical problem solving skills through the Problem Based Learning Model***

Outdoor mathematics learning with the MCM (Math City Map) application is one way to increase the learning capacity of students, learning outside the classroom with the MCM (Math City Map) application will help students apply what they know if learning in a classroom with many limitations. In addition, learning mathematics outside the classroom is more challenging because it bridges learners between real-world reality and the theory taught in the book. In the real world, quality learning can improve learning outcomes and improve social and personal skills. ((Rosanti & Salah, 2022). The MCM (Math City Map) app will help students use their knowledge outside the classroom. In addition, because of the bridge between the theory taught in the book and real-world circumstances, learning math outside the classroom becomes more difficult for students. The quality of learning in a real-life environment can improve the ability to achieve learning through what is learned and increase the ability to solve problems.

Learning through model implementation *Problem Based Learning* (PBL) is better able to solve math problems than students who follow conventional learning. The Problem Based Learning (PBL) model is an alternative learning model that is appropriate for mathematics teachers because it actively involves students in the process of developing mathematical problem solving skills (Marchy et al., 2022). The results showed that students who used problem-based learning models had better and more effective mathematical problem solving skills than students who used conventional learning.

3. *Measuring the development of students' problem-solving abilities through the Problem Based Learning and Math City Map Assisted learning model*

On research (Exam et al., 2023) states that with the help of applications carried out in groups and inquiry that provokes, the critical thinking skills of learners increase. Therefore, it is possible that the use of Math City Map will improve learners' ability to think critically and mathematically. Thus, the ability of learners to solve problems will also increase. Based on the results of the study (Wahyudi et al., 2023) stated that mathematics learning of grade V students of SDN 265 Timampu can be influenced by the application of a problem-based learning model based on the Math City Map application. This is shown by the fact that student learning outcomes on the pre-test test are 8 percent perfect, while student learning outcomes on the post-test test are 100 percent perfect. From the results of the student response questionnaire, it can be seen that on average 78% give a positive response, and an average of 86% indicate that students are active in the learning process. This shows that when problem-based learning models are applied with the help of the Math City Map application can improve the mathematics learning outcomes of learners.

Treatment using the Math City Map approach emphasizes the effectiveness of providing various practice questions. This has an impact on students' experience in solving various problems. In addition, the use of math city map media assistance presents new learning motivation and experiences for students in learning, namely by directly solving direct problems related to surrounding objects packaged in story problems and being able to hone their mathematical critical thinking skills so that they can improve critical thinking skills with high criteria. Based on the results of the study (Wahyudi et al., 2023) The results show that mathematics learning outcomes can be influenced by the application of the Math City Map application-based problem-based learning model. The results of student activity, with an average of 86%, indicate that students are active in the learning process. This suggests that the application of this model can improve mathematics learning outcomes.

CONCLUSION

The use of the Math City Map approach can affect students' ability to solve math problems. The use of the Math City Map approach helps students understand and overcome math problems better and effectively in developing students' problem-solving skills. Learning outside the classroom using MCM applications provides a more immersive and challenging experience for students, helps them apply knowledge, and refines social and personal skills. The Math City Map approach can be used to measure spurring learners to think critically and the development of learners' problem-solving abilities, which contributes to improved mathematical literacy and critical thinking skills. The application of the Math City Map-based learning model in mathematics learning has proven effective in improving student learning outcomes, with significant improvements in learning completeness and positive responses from students. The Math City Map learning model emphasizes diverse problem exercises and provides motivation in learning mathematics. This can improve students' mathematical critical thinking skills, so the Math City Map approach has great potential to improve students' ability to solve problems in mathematics learning and can be used effectively in mathematics learning.

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