

Metasynthesis of Learning Device Development Based On Problem-Based Learning To Improve Mathematics Communication Ability

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Abstrak. *This study aims to improve students' mathematical communication skills through research articles conducted by previous researchers. Due to the large number of similar studies related to the development of learning tools based on problem-based learning in improving mathematical communication skills, this study was designed with a four-stage metasynthetic system, namely identification, assessment, interpretation and criticism of 5 journal articles that will be synthesized. The learning tools developed by previous researchers through synthesized journal articles are RPP (Learning Implementation Plan), Syllabus, LKPD (Student Worksheet) and learning evaluation sheets. The development of learning devices carried out by previous researchers was carried out with several stages of improvement after being examined and assisted by the validator team. Some articles use 2 learning systems, namely the division of small groups and large groups in the classroom and the use of author and indoor learning systems. From the results of the synthesis of journal articles that each learning device developed is suitable for use in the classroom learning system because it meets valid, practical and effective criteria at different levels of value and students' mathematical communication skills studied by previous researchers have increased. (Jurnal Fibonacci, 02(2): 58-61, 2021)*

Kata Kunci: Metasynthesis, Learning Device, Problem-Based Learning, Communication Mathematics

Pendahuluan

Mathematics is a knowledge that has an important role in the development of science and technology. According to Baroody (in Lim & Cheng Meng Chew, 2007), there are two important reasons that make communication the focus of attention in learning mathematics, namely: first, mathematics is a language, mathematics is not only a thinking aid that helps us find patterns, solve problems, draw conclusions, but mathematics is also a good tool for communicating various ideas so that they are clear, precise, and concise, and secondly, learning mathematics is a social activity, both between teachers and students and between students themselves.

Likewise the results of field observations conducted by Deswita et.al. (2018) show that students have not been able to communicate mathematical ideas well, convey their ideas, compose arguments well, and state a mathematical problem in the form of symbols, diagrams, or models. It is necessary to have an optimal learning process using models, methods, or approaches that can enable students to rediscover mathematics based on their own efforts and the need for good learning device in the process of improving students mathematical communication ability.

The same is the case with the learning process that is applied in the classroom. The processes carried out really require appropriate interaction between students and teachers or other fellow students. Teachers are expected to be able to help students develop their own knowledge by being actively involved in the learning process and students can also train their independence in learning so that students can improve their understanding because they have found concepts and conclusions in learning independently. This learning process must be developed and implemented in the classroom.

Metasynthesis is a literature review method that integrates the amount of information presented by previous researchers, identifying differences in study results between one researcher and the study results of other researchers so that other researchers are younger in knowing the overall results or conclusions of research on learning device development.

In addition, teachers also need a learning model that can deliver the learning device that have been arranged to students. One learning model that can help students improve their mathematical communication ability is the Problem Based Learning (PBL) learning model.

Starting from or related to the previous explanation, namely the number of similar studies

regarding the development of PBL model learning device to improve students mathematical communication ability, the authors found gaps in results that occurred from various studies, therefore researchers conducted research related to "Metasynthesis of Learning Tool Development with Models. PBL to Improve Students Mathematical Solving Ability" to get new results in the form of new concepts or understandings and conclusions through summarization, elaboration for further researchers and readers.

Metode Penelitian

This research applies an inductive research perspective, focuses on individual meanings and translates the complexity of a problem. This type of qualitative descriptive research uses a metasynthesis approach, which is a method literature review that identifies, assesses, and interprets all findings on a research topic, to answer predetermined research questions. Furthermore, by definition, metasynthesis is a technique of integrating data to obtain new theories or concepts or a deeper and more comprehensive level of understanding (Perry & Hammond, 2002).

This type of research is a Systematic Review using metasynthesis research method. Metasynthesis is a literature review method that identifies, assesses, and interprets all findings on a research topic, to answer research questions pre-defined.

The subjects in this study were journal articles regarding the development of learning device to improve students mathematics communication ability and the object in this study was the student's mathematics communication ability before and after using the learning device that had been developed.

The data collection technique used in this research is the documentation method. The documentation method is a data collection method by finding or extracting data from literature related to what is meant in the problem formulation. The data that has been obtained from various literatures are collected as a single document that is used to answer the problems that have been formulated. The purpose of the data collection process is to identify and collect all studies relevant to the research to be carried out.

Hasil dan Pembahasan

In the first source, research conducted by Sri Winarni and Marlina (2020), namely the development of learning device in the form of worksheets with Algebra material and 4-D

development models and the characteristics of the device developed are in accordance with PBL steps so that they can generate indicators and good mathematics communication activities. Orally and in writing. Through the designed learning device, students are expected to have an increase in mathematics communication, namely being able to express mathematics ideas to fellow students and teachers. The development of the devices arranged has a valid value according to the design results, is very valid according to the validation results of the material expert and is very practical based on the responses of teachers and students.

In the second source, this study describes the level of mathematics communication ability which is one of the objectives of learning mathematics, activities and student responses in the problem-based learning process so that students are able to develop thinking, problem-solving and intellectual ability with research instruments, namely the development of Lesson Plans, Teacher Books, Students Book and LAS.

In the third source, this research was conducted because of the difficulty of teachers in implementing the 2013 curriculum, which requires students to be active in classroom learning. The validation of learning devices that have been made fulfills the validity test by the validator with the results of students mathematics communication ability being effective. In the fourth source, it is carried out to help students understand the concept of the material and spur students' ability to communicate ideas or ideas mathematics ly through the development of problem-based learning device with the method of developing lesson plans, worksheets and students mathematics communication test sheets. and the fifth source.

In developing learning device, of course, researchers need a development model as steps in developing these products. The steps or stages of research and development are of course selected and adjusted to the conditions of the research field. There are several development models used by researchers from the 5 research sources used as data in this study, namely using the 4-D development model (four D models) by Thiagarajan and Semmel (1974) with the following steps: 1) Define (definition) (2) Design (planning) (3) Develop (development) (4) Disseminate (deployment) and use the ADDIE development model which consists of five stages, namely analysis, design, development, implementation, evaluation.

The product produced in the cited journal article studies can be said to have met the aspect validity of the content because in the development process it has been adjusted to the 4D development procedure. Meanwhile, in terms of construct validity, where the assessment is based on the linkages between the various components that make up the product, by two experts, it is also stated that they have met the requirements.

Judging from its practicality, the learning device developed in the cited journal article research have met practical criteria. In testing the learning device that the research made was carried out in several stages (test I and test II) and also in small groups and large groups. When viewed from the results or the average value of student questionnaires, both questionnaires to teacher responses and questionnaires to student responses, good scores and good categories are obtained, which shows that the learning device developed can be used properly during learning so that it fulfills practical aspects.

The effectiveness of this learning device is determined by seeing how well this learning tool can improve student activity and learning outcomes. The results of observations of student activity showed from cycle to cycle. This is inseparable from the implementation of problem-based learning model which requires students to be able to find ideas and to know how to learn and work together in groups to find solutions to problems with the help of learning device in the form of lesson plans, LKPD / LKS / LAS and student mathematics communication ability test sheets. In addition to learning activities, students mathematics communication ability, both seen from the average score and classical completeness, also experienced an increase in each trial of learning devices that had been compiled and had met the criteria for being effective.

Based on these three findings, whether seen from the validity test, practicality test and effectiveness test, the learning device developed in the following journal articles have succeeded in supporting learning and can improve students mathematics communication ability.

Thus the selection and use of the Problem-Based Learning model used in journal articles by previous researchers to improve students' mathematical communication ability can be said to be effective because PBL is a learning model that is closer to authentic problem solving such as problems that occur in everyday life and can involve students to solve problems through the stages of the scientific method so that they can

learn knowledge related to the problem and at the same time have the ability to find solutions and solve problems. PBL allows students to be more active in learning to acquire knowledge and develop thinking patterns through presenting problems with a more real scope, namely problems that often occur in everyday life and PBL can provide opportunities for students to apply their knowledge in the real world.

The criticism (last stage of metasynthesis) in the synthesized journal article is based on the opinions of experts in the use of the development of learning device used by previous researchers and the indicators applied in the Problem-Based Learning model in improving students' mathematical communication ability. When viewed from the writing of the article, in the first source the results from the initial analysis of student answer sheets in the define stage (the development stage with a 4D development model) and from the results of phase 1 to phase 5 of PBL are not attached significantly in explaining that it is true that mathematical communication ability have increased (only attach the average value, categories and criteria for validity and practicality).

In the third source it is said that the RPP and LKPD were developed 5 times but the increase in value was not attached significantly. In this second journal article, the previous researcher used a PBL-based learning model that started from contextual problems and was combined with the development of learning device based on four aspects of formulating mathematical communication ability indicators related to SPLDV material. Of the four aspects described, the teacher's role in facilitating the learning process is still not attached. This is somewhat based on the characteristics of PBL which were said by Polia, Barrow and Min Liu that the teacher's role as teachers act as facilitators in helping students to convey and communicate the results of discussions with their friends to the front of the class and analyze and assess thinking for mathematical strategies that want to achieve.

For further researchers who want to conduct relevant research related to the development of Problem-Based Learning model learning device to improve students' mathematical communication ability so that they are more thorough in compiling learning device to be given to teachers and students so that the achievement of mathematical communication can be achieved properly (according to indicators and predefined characteristics).

The results of research on 5 journal articles about the development of learning device based on Problem Based Learning model to improve mathematics communication ability of students found that there are many differences in the learning device developed. These differences are in the form of strategies used in learning device which include syllabus, lesson plans, LKPD and LAS, their development models, as well as the score of aspects of validity, practicality, and effectiveness of learning device developed to improve students mathematics communication ability.

Metasynthesis provides a comprehensive description of the development of learning device based on Problem Based Learning model to improve mathematics communication ability. The learning device developed is the most important thing in facilitating the improvement of students mathematics communication ability. Several learning strategies with the PBL model used in the learning device in this research source are the development of the 4-D model which consists of the stages of define, design, develop and disseminate as well as research & development (R&D) with the 4-D model which refers to the Thiagarajan development theory and Semmel.

Assessment of the quality of the results of the development of learning device requires three criteria, namely validity, practicality, and effectiveness. The results of the research analysis of journal articles used as research sources found that all the learning device developed had met the valid, practical, and effective criteria in the good and very good categories.

Daftar Pustaka

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