Development of learning devices based on the class of realistic nursing skills training programs in mathematics, teaching x

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Abstract. This study focuses on the development of mathematical learning tools based on realistic mathematics instruction for the Class X Professional High School Nursing Education Program to improve students' mathematical communication skills. Learning tools designed in the form of Learning Implementation Plans and Student Worksheets. The development model used in this study is the Plomp model including the preliminary research phase, the prototype phase and the evaluation phase. However, this research only reached the preliminary stage of the research. The subjects in this study were students in the Nursing Science Competency Program Class X SMK Bukittinggi. The development of learning tools is done by linking the topics of nursing expertise programs with mathematics through a needs analysis and a concept analysis. The results of the curriculum analysis show that the students' mathematical communication skills are still weak. One of the factors behind the students' mathematical communication skills has not been optimally achieved, namely the lack of learning devices that facilitate the improvement of mathematical communication.

1. Introduction

One of the goals of learning mathematics is to improve students' mathematical communication skills. Communication is perceived as the way students express their mathematical ideas using mathematical symbols or language, both verbally and in writing, to explain the problem and to provide arguments or solutions to problems mathematics. A good communication process can help students deepen their understanding of ideas or ideas in mathematical models to make it easier. Because communication skills are so important, mathematics learning needs to be well designed to stimulate students in developing their communication skills. A good communication process will potentially motivate students to develop ideas and learn mathematical skills. The National Council of Teachers of Mathematics (NCTM) [1] states that mathematical communication skills are an important element of mathematics and mathematics education. Mathematical communication is defined as an event or mutual relationship that occurs in the classroom environment, where the transfer of messages as mathematical, such as concepts, formulas or strategies to solve a problem.

Mathematical communication skills are important for students to interpret and express their understanding of the mathematical concepts and processes they are learning. Mathematics is a compulsory subject taught in vocational high schools. Vocational schools are educational institutions
that prepare students to be ready to enter the world of work. This is in line with Article 15 of Law No. 20 of 2003 [2] on the National Education System, according to which vocational education is a secondary education mainly preparing students to work in certain fields. Armiati [3] also indicated that vocational training students were ready to enter the labor market with the skills they possessed.

According to the results of interviews with several teachers at Bukittinggi GENUS vocational school, one of the causes of the difficulties encountered by vocational training students in the learning process is the lack of mathematical communication skills of apprenticeship students, in order to make students unable to link learning to the environment. The desired mathematical communication skills are as follows: (1) students relate real objects, images and diagrams to mathematical ideas, (2) their ability to explain ideas, situations and mathematical relationships in mathematics, writing with real objects, images or algebras (3) the ability to express everyday events in the form of language or mathematical symbols, (4) the ability to formulate conjectures, construct arguments, formulate and generalize (5) to explain and ask mathematical questions learned. This is reflected in the students’ difficulty in interpreting the problem in the form of images, symbols and conversely

One of the factors that does not help students communicate their learning is the application of the questions asked by the teacher that is still of a general nature, there is no relationship between the program of skills they choose. The problem also encountered at the Vocational School concerns learning tools used by educators who are always universal. The lesson plans used for each program of expertise are equalized regardless of the expertise of the students in the vocational schools. The application of mathematical problems with the field of expertise of students is also lacking, so that they assume that there is no relationship between mathematics learning and the chosen professional program. This is in line with Armiati’s opinion in Laia [4] that the causes of mathematics learning are less desirable for vocational education students, namely that learning tools and teaching materials used by teachers are still of a general nature.

Based on the above problems, it was necessary to improve the learning tool in the form of lesson plans. The lesson plan designed to solve the above problems is a lesson plan based on the teaching of Realistic Mathematics Education (RME). RME-based lesson plan can improve students’ communication skills because, in its application, RME invites students to learn with their environment. This can be seen in previous studies conducted by Muriana Hastratuddin [5], claiming that RME-based learning tools are able to improve students' mathematical communication skills, as they are encouraged to use their environment to start learning. Learning tools become a guide for teachers in implementing classroom learning. In Permendikbud No. 65 of 2013 [6] concerning the process standards for basic and secondary education states that the preparation of mathematics learning tools is part of the planning of learning that can enhance the skills of students learning and enable them to achieve the goals of learning mathematics. Therefore, the learning tools of SMK need to be improved. One of them is developing a learning model based on a realistic teaching of mathematics (RME).

The RME is a learning approach used only in mathematics education. According to Soedjadi [7], the realistic approach emphasizes the use of the reality of life or the results of local culture as a starting point for learning. Soedjadi also explained that reality is a tangible or concrete thing that students can observe or understand through their imagination. It can therefore be concluded that RME-based learning uses the student environment, both the school environment, the home environment and the community environment, so that RME can improve communication skills. When learning. This is contained in the RME principle mentioned by De Lange in Fauzan [8], including: (1) the use of real-life contexts, (2) the use of models, (3) the use of results student contributions, (4) interactions, (5) interrelationships that this RME approach initiates the learning process by its close (contextual) nature with students, and that students must communicate their ideas and use their own thinking to solve contextual problems and answer questions. This learning process can enhance students’ mathematical communication skills.

In addition to being able to improve the students’ mathematical communication skills, the RME approach can also be used in vocational school with several programs of expertise, including nursing expertise programs. Because the RME approach uses contextually relevant issues for students. The use of contextual issues may also be related to the student professional school program of expertise, so that
students are interested in learning mathematics because there is a relationship with experience and programs of expertise students themselves.

The RME approach is closely related to horizontal and vertical mathematics. This horizontal mathematics is a process that begins with the completion of contextual questions by students using symbols, language and their own way. In addition, vertical mathematics consists of determining whether students have found a solution to the problem using a mathematical language or have found a particular algorithm or procedure.

Based on the descriptions above, a study entitled "Developing Learning Tools Based on the Class 10th Nursing Expertise Program in Realistic Math Education".

2. Methods
The development model used in Development Research is a development model developed by Tjeerd plomp. The Plomp [9] model comprises three phases: the preliminary research phase, the development or prototyping phase and the evaluation phase. Preliminary research phase (preliminary research) Activities carried out, namely: needs analysis, curriculum analysis, concept analysis and student analysis. The initial investigation phase was carried out by the class X nursing program of the type of vocational school.

The results of the initial survey serve as a basis for developing the learning tools to be designed. A needs analysis is needed to obtain information on the problem of the gap between the existing and the expected situation. The purpose of this phase is to obtain information on the problems that be corrected. The collection of information is done by observing the process of learning in class and interviewing the teacher. The concept analysis aims to develop and organize the materials that will learn. So that the results of the needs and concept analysis can be realized during the phase or the development of the prototype

3. Results and Discussion
Based on a preliminary analysis conducted at the Bukittinggi Genus Vocational School, it was found that the learning process was not conducted optimally. One of the goals of mathematics learning, namely the mathematical communication ability of students, was still weak. This is due to the lack of implementation of the learning process that can improve students' mathematical communication. The current learning process is still conventional and not in line with the 2013 program. Students' interest in learning is always low, students are less active in learning because they only accept what teacher explains. Similarly, the learning tools used by teachers in the form of lesson plan and students worksheet are still general for all skills programs.

The activities in the teacher-designed lesson plan are good, but the activities in the lesson plan did not help students to find concepts from the material studied. The steps of the basic activities are always visible. Teachers tend to provide an explanation of the basic material directly, to provide formulas, to give examples of questions and directly to the exercise. As teacher questions are still common, students struggle to resolve questions about mathematical communication skills. They tend to wait for the teacher's answers to make them less able to expose their own knowledge to problem solving. related to mathematical communication.

Lesson plan analysis shows the presentation of the material directly on the core material. Participants in education receive a concept that will be studied. In lesson plan, there is no activity actively involving students in the search for learning concepts. The lack of involvement of students in building their own knowledge so that students tend to memorize the formula and that students easily forget the formula they have memorized. The lesson plan method used did not help students achieve their learning objectives, especially their mathematical communication skills. The available lesson plan was not specifically dedicated to developing students' mathematical communication skills, so teachers find it difficult to achieve these learning goals. For students' mathematical communication skills to be improved, teachers need learning devices that enable students to develop their mathematical communication skills.
One solution to this problem is to develop learning tools, including learning materials in the form of lesson plan, that can help students achieve their learning goals. Lesson plan is a printed instructional material that can help teachers achieve their learning goals, including improving students’ mathematical communication skills. The lesson plan provided must be based on a learning approach that encourages students to be active, the learning must be focused on students and is based on an activity that can improve their skills in mathematical communication. One approach used is the Realistic Mathematics Education (RME) approach.

The RME approach is an approach that aims to motivate students to understand the concept with problems in students’ daily lives. For this reason, RME is suitable for students in vocational training because the problems encountered in learning based on the RME have a link with real situations very easily understood and imagined by students and are no exception to the rule for students in professional training of nursing expertise programs. develop skills in mathematical communication because RME is an approach that can be used to help students develop mathematical communication skills and the RME approach can be applied to nursing expertise programs. In addition, the developed lesson plan must be able to draw students' attention to its use.

A concept analysis is performed to determine the content and subject that will be presented in the Learning Kit. The concepts are analyzed by linking the concepts and the systematic control of the materials. The steps in this analysis examine the concepts that will be addressed in mathematics, and then the links between concepts and material are organized in a systematic and orderly manner. Based on the results of the conceptual analysis, the composition of the material is obtained as follows: (1) rank of roots and logarithms, (2) linear equations and linear inequalities, absolute values, (3) SPLDV, (4) linear programs, (5) arithmetic sequences and arithmetic sequences, (6) Geometric sequences and geometric sequences, (7) Growth and decomposition and interests and annuities.

4. Conclusion
The RME-based mathematics learning tool developed in this study reached only the stage of preliminary research. The plomp model used in the study included three phases: the preliminary research, the prototyping phase and the evaluation phase, which were very useful for developing RME-based mathematics learning tools. With the existence of mathematics learning tools based on RME, it should be able to increase students' learning of mathematics because they are designed in accordance with the student's program of expertise. Learners become more active in the learning process and are able to relate the subject to everyday life or to other acquaintances.

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