Analysis of The Curriculum Expertise Program Art in The Development of The Learning Based on Realistic Mathematics Education Approach

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The abstract. The study aim to analyze the curriculum to see and find out the linkages between Basic Competence mathematics and Basic Competence productive subjects in the art expertise program. This research was part of Plomp's model development research. Curriculum analysis is carried out to obtain information in developing mathematics learning devices in the form of Learning Implementation Plans and Student Worksheets based on the Realistic Mathematics Education (RME) approach. From the results of curriculum analysis that has been done, it was obtained data that not all Mathematical Basic Competencies have anything to do with productive subjects in the fine arts expertise program. From a number of mathematics material in grade one 1st semester, there are four materials that have relevance to the context studied in students’ productive subjects, including the absolute value of one variable, the system of three-variable linear equations, functions, and the composition of functions. This means that the context studied in productive subjects can be used as an initial problem in the process of learning mathematics in the material

1. Introduction

Vocational School is one of the formal education where the learners are prioritized and prepared to work in accordance with their respective expertise program. National Education System Law Article 15 Ministry of Education [1] states that vocational education is secondary education that prepares students for entry into the work place. Dwi Jatmoko [2] argues that vocational schools are an educational institution that has the potential to prepare the human resources (HR), which can be absorbed by the world of work.

Based on The Director-General of Primary and Secondary Education No. 130 / D / Kep / KR / 201 Date: February 10, 2017 On Vocational Secondary Education Curriculum Structure [3], that vocational school comprises nine areas of expertise include: (1) technology and engineering, (2) Energy and mining (3) Information and Communication Technology, (4) Health and Social Work, (5) Agribusiness and Agro-technology, (6) maritime, (7) Business and Management, (8) Tourism, and (9) Arts and Creative Industries. Of the nine areas of expertise at the top, each subdivided into several membership programs. Permendikbud number 60 of 2014 [4] concerning the 2013 curriculum vocational school that curriculum vocational school divided into three subjects among others charge groups A, B, and C. Payload subjects groups A and B is a group of general subjects, while subjects in group C contains about vocational specialization subjects. This means subjects in group C is adjusted to the selected competency skills in vocational learners.
In order to achieve the learning objectives in vocational school is necessary to develop the potential of learners in vocational programs in accordance with their respective expertise. Based on the decision of the Director-General of Primary and Secondary Education No. 30 of 2017 concerning CC (core competencies) and BC (Basic Competence) Subject Payload National, that CC and BC in vocational divided into 3 parts: C1 (Basic Expertise), C2 (basic Skills Program), and C3 (basic Skills Competency). From the above, it can be concluded that C1, C2, and C3 is a mandatory competency in vocational studied by learners that includes productive subjects in accordance with the program membership.

Of some existing skills program, researchers chose one expertise program, namely the arts expertise program in the field of arts and creative industry experts. As with other skills program, fine arts expertise program requires students to be able to produce a product or works which will be marketed. For it should be supported with problem-solving skills so that learners are trained to innovate so as to create a creative product that is different from before. With the creation of products that are more creative then the product will sell high value. Problem-solving ability is one of the goals of mathematics learning in vocational school.

Mathematics is one of the subjects that are taught in vocational schools and is a determinant of graduation of students of vocational school. Learning mathematics in a vocational vehicle which facilitates the ability to learn mathematical learners based on the competence that he has. One mathematical ability of students is based on mathematical learning objectives set out in Permendikbud No. 58 of 2014 is the mathematical problem-solving ability. It is right as stated by Hudojo [6] that "problem-solving has an important function in mathematics teaching and learning activities". It shows through mathematical problem-solving ability, vocational student can apply the concepts and use skills in real situations faced many problems in the world of work based on the programming expertise.

Reality had shown the process of learning mathematics in vocational still far from expectations. This is evident from the initial observation the researchers do to see the problem-solving skills of learners vocational art program at vocational students to give about mathematical problem-solving skills to learners. The shape of the given problem is "In a cage, there are goats and chickens as many as 30 individuals. If the number of goats and chicken feet is 76. Then calculate the respective number of goats and chickens! ". Answer learners showed in Figure 1 below.

![Figure 1. Answer Student](image)

From Figure 1 above, it could be concluded that the students have not been able to solve the given problem, the students just memorize steps to resolve the problem usually given without knowing what the actual problem-solving. Seen from the indicator of problem-solving, students do not understand the problem given. This can be seen from the students' answers, which in the matter of the number of goats and chicken feet is 76, but students write \( x - y = 76 \), while the answer should be \( 4x + 2y = 76 \) because there are 4 goat legs and chicken feet 2. From these answers it can be said students have not met the first problem-solving indicator that is understanding the problem, it would also affect the further indicator that the settlement plan, implement the completion strategy, and check back.
After the researchers dug deeper, a learning tool used by teachers is still general or the same can be said for any programming skills. This condition causes the learners are less actively involved in the learning process and the difficulties in solving mathematical problems. Moreover, teachers do not use Worksheet Students in the learning process. This is in accordance with the results of research conducted by Armiati [7] said the cause of the mathematics courses in a vocational less desirable device that learning and teaching materials that are used together with learning devices and materials used in high school. Hestu Tansil La’ia [8] research also states that mathematics subject teachers use mathematics learning tools that are the same for all areas of expertise in vocational school and the context of the problem used in the same so that learning objectives are not achieved as expected and the student’s problem-solving abilities are low. Necessary improvement to overcome these problems, necessary improvements to the learning device used linking material math skills program with an approach art Realistic Mathematics Mathematics (RME) for the learning process more interesting and meaningful so that it can improve problem-solving abilities of learners.

RME-based learning device designed for the principles and characteristics of Realistic Mathematics Education (RME) that the learning process will start from the realistic thing or things close to the learners, this means that according to the learners' skills program. Hadi [9] in his research said RME uses real world that can be imagined or real in the mind of the learner as a starting point for developing ideas and concepts in mathematics. So in the learning implementations plan and student worksheets will begin on matters relating to the competence of fine art skills program. So that learners are interested and have the interest and motivation to begin the process of learning mathematics and will also have an impact on the mathematical problem-solving ability of students. Furthermore, according to Hidayat and Sariningsih [10] in mathematics problem solving is central to learning a basic ability in the learning process. To enhance the problem-solving skills need to be developed to understand the problem, create a mathematical model, solve problems, and interpret the solution. Therefore RME with steps to improve their mathematical problem-solving ability of students. Mujiasih [11] stated that mathematics learning using realistic mathematics education views mathematics as a daily human activity, so that it can solve the problems of everyday life an essential part. In previous studies linking realistic mathematics education with daily life, but in this study realistic mathematics education is associated with the context studied by students in the fine arts expertise program.

To produce the design devices based math learning Realistic Mathematics Mathematics (RME) in accordance with the program of fine arts expertise, curriculum analysis is needed first. Curriculum analysis was undertaken to examine the contexts studied in subjects that can be linked to productive mathematics. So before learning tools developed and used, curriculum analysis is needed first.

2. Method
This study was part of research development at Plomp development model. Plomp [12] development model consists of three stages, including preliminary analysis, prototype development phase and the assessment phase. This model was chosen because it has several advantages, one of them in terms of practicality, where practicality on the model Plomp rated of the three stages, namely the one-to-one, small group, and field evaluation tests [13]. Analysis of the curriculum that does belong to the preliminary analysis phase.

This research belong to descriptive qualitative research. Data collection techniques by triangulation (combined), data analysis is inductive/qualitative and qualitative research results further emphasize the significance of the generalization. Descriptive aims to describe the systematic and accurate facts and characteristics issues gained in the field. Sources of data obtained from observations. Methods of data collection in the form of a combination of the observer. Analysis of the data in this study using an interactive model that consists of data collection, data reduction, data presentation, and conclusion data. Some of the steps being taken for analysis by analyzing curriculum and subjects mathematics curriculum productive by looking at the basic competence and the individual indicators and observe. Analysis of the data in this study using an interactive model that consists of data collection, data
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3. Result and Discussion
Curriculum analysis was conducted to see the suitability of core competencies and the Basic Competency, Competency Achievement Indicators (GPA) as well as the learning objectives in mathematics in vocational material. Based Kepmendikbud Number: 130 / D / KEP / KR / 2017 [13] of the structure of vocational education curriculum that Competency. Mathematics in vocational divided into two parts of mathematics technology and now technology mathematics.

Given the conditions and time researchers, curriculum analysis in this research for the technology now maths skills program of art in grade one semester. Mathematical material taught in grade one vocational school in the first semester including: (1) the exponential number, (2) irrational numbers, (3) logarithms, (4) the absolute value, (5) a system of linear equations of three variables, (6) function, (7) the function of the composition. But not all lessons learned math above can associate with subjects, productive learners.

According to an analysis conducted curriculum, one of the basic competency material in grade one vocational school mathematics in fine arts skills program which can be developed on a semester learning devices seen in Table 1 below:

| No. | Matter                  | Basic competencies | Knowledge | skills                      |
|-----|-------------------------|--------------------|-----------|----------------------------|
| 1.  | exponential number      | 3.1                | Applying an operation on air-rank numbers | 4.1 Resolve the contextual problems related to operations at the exponential number |
| 2.  | irrational numbers      | 3.2                | Applying operations on irrational numbers | 4.2 Resolve the contextual problems related to operations on irrational numbers |
| 3.  | Logarithm               | 3.3                | Applying the concept of logarithms         | 4.3 Resolve the contextual problems related to the logarithm |
| 4.  | The Absolute Value Variable | 3.4            | Develop linear equations and inequalities of one variable that contains the absolute value of contextual problems | 4.4 Completing the contextual issues related to equality or inequality linear one variable that contains the absolute value |
| 5.  | Three Variable Linear Equation System | 3.5          | Develop a system of linear equations of three variables of contextual problems | 4.5 Resolve the contextual problems associated with the system of linear equations of three variables |
| 6.  | Function                | 3.6                | Determine the function (linear functions, quadratic) | 4.6 Completing the contextual issues relating to the area of
| No. | Matter                  | Basic competencies |
|-----|-------------------------|--------------------|
|     |                         | Knowledge             | skills                             |
|     |                         | functions, and rational functions) formally that includes notation, place of origin, local results, and symbolic expressions, as well as a sketch of the graph | origin, local results, and create graphs of functions. |
| 7.  | composition of Functions | 3.7 Determining the arithmetic operations (addition, subtraction, multiplication, and division) and the composition operation on the function | 4.7 Solve problems that involve arithmetic operations and function composition operation |

From the table 1, there are some materials studied mathematics in the 1st half, namely vocational school exponential number, irrational numbers, logarithms, the absolute value of one variable, systems of linear equations of three variables, functions and composition of functions. After that, the researchers conducted a review of basic competencies subjects productive learners expertise fine arts program. The membership program has some competence skills. Researchers also analyzed linkages there are some basic competencies on the subjects of art productive skills program which can be raised the problem in mathematics.

Based on the analysis of basic competencies mathematics and basic competencies product if art skills programs, the competence mathematics is related to productive subjects fine arts skills program. From some of the material grade one math 1st semester there were four items that have relevance to the context studied in subjects such productive learners the absolute value of one variable, systems of linear equations of three variables, function, and composition of functions. This means that the context studied in subjects that could be used productively as a problem early in the learning process of mathematics on the material. It will attract the interest and attention of learners for mathematics material was useful for program expertise. Here was an example of using the context of productive subjects in mathematics learning to program fine arts skills after grade one of vocational school curriculum analysis.
The picture above is an example of using the context of productive subjects on the material system of linear equations of three variables. The problems presented using the context of the tools used in the painting are included in the Basic Competency subjects of the basics of art. So, for an analysis of the curriculum of the Basic Competency mathematics and basic competencies of productive subjects very helpful in presenting the problems in mathematics so that the issues are presented varies according to the learners' skills program.

4. Conclusion

RME-based math learning tool developed in this study only reached the stage of preliminary research. Plomp used models of research that consists of three stages: preliminary research, prototyping phase, and assessment phase assist in the development of learning tools RME-based math learning. With the learning of mathematics-based RME devices is expected to increase learners to study mathematics because the device is designed in accordance with the programming skills of learners. Learners become more active in the learning process and being able to connect the subject matter with everyday life or other sciences. This research phase is still at the preliminary research stage, namely curriculum analysis, it is hoped that further research will be carried out at the next stage, namely the prototyping phase and assessment phase.

Reference

[1] Ministry of Education 2008 Development Guide Content and Infrastructure Standards Vocational High School (SMK) and Madrasah Aliyah Kejuruan (MAK) (Jakarta: Ministry of Education).

[2] Director General of Primary and Secondary Education 2016 The Spectrum of Vocational Secondary Education (Jakarta: Directorate General of Primary and Secondary Education)

[3] Permendikbud 2014 Basic Framework and Curriculum Structure of Vocational High School / Vocational Madrasah Aliyah (Jakarta: MONE)

[4] Director General of Primary and Secondary Education 2017 Core Competence and Basic Competence Subjects National Freight (Jakarta: Directorate General of Primary and Secondary Education)

[5] Hudojo H 2005 Curriculum Development and Learning Mathematics (Malang: The Malang Teachers Training College UM Press)

[6] Armiati 2008 Development of Professional Competence-Based Mathematics Modules In Vocational High School of Technology (Padang: Education Ministry Director-General Competitive Research Grant Faculty UNP)
[7] Hidayat R S 2018 Revelation mathematical problem solving ability and adversity quotient junior high school students learning through open ended JNPM 2 1-109
[8] La’ia H T & Armiati 2018 The developed mathematics learning tools which based on professional competency in the phase of one to one evaluation for trigonometry topic in the major of information and communication engineering of smk ASSEHR 2 85 - 97
[9] Hadi S 2005 Realistic Mathematics Education and Its Implementation (Banjarmasin: Tulip)
[10] Hidayat R S 2018 Revelation mathematical problem solving ability and adversity quotient junior high school students learning through open ended JNPM 2 1-109
[11] Mujiasih 2013 Melatih kreativitas dan daya nalar siswa melalui model pembelajaran rme Phenomenon Jurnal Pendidikan MIPA 119-30
[12] Plomp T & Nieven M 2013 Educational Design Research-Part A An Introduction Enschede Netherlands Institute for Curriculum Development (SLO) PQ4R Strategy accompanied by Refutation Text Reading