Research Article

Realistic Mathematic Worksheets for Elementary School Teacher Education Students to Improve Problem Solving

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Abstract.

The latest government policy regarding the implementation of the minimum competency assessment (AKM) has an impact on several aspects. One of them is students' readiness, particularly in elementary schools, to become accustomed to carrying out the literacy and numeracy processes in learning. Prospective elementary school teachers, who are also elementary school teacher education students, are one of the primary targets in their preparation to become teachers who teach or train elementary school students to solve problems, particularly mathematics problems. Approaching realistic mathematics learning based on problem-solving is one of the efforts that can be made in training students. The research aimed to create a student worksheet that used a problem-solving-based realistic mathematical approach. The development method used was a 4D model, which includes defining, designing, developing, and disseminating. The use of student worksheets with a realistic mathematical approach based on problem-solving by elementary school teacher education students as a basis for habits that have been ingrained from an early age, so that later they will be able to apply similar things when they have practiced learning in the field, is the result of this research.

Keywords: worksheets, elementary school, realistic mathematics, problem solving

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1. INTRODUCTION

Elementary School Teacher Education Students are at the forefront of educator formation at the most fundamental level, namely Elementary School. Before going into the field to practice what they have learned, Elementary School Teacher Education students learn a variety of things, including pedagogy, the characteristics of elementary school students, and even all theoretical concepts that will be taught in school. The curriculum is also something that Elementary School Teacher Education students must learn, and they must always be able to adapt to curriculum changes, which can be difficult to predict at times. The implementation of the National Assessment is one of the most recent policies in a curriculum that is used in schools [1] . The national assessment is a quality assessment program that is carried out in all schools, madrasas, and the

primary and secondary level equivalence program for each school. The basic student learning outcomes (literacy, numeracy, and character) as well as the quality of the teaching and learning process and the climate of the educational unit that supports learning are used to assess the educational unit's quality. The data came from three main sources: the Minimum Competency Assessment, the Character Survey, and the Learning Environment Survey [2].

The Minimum Competency Assessment, one of the main instruments in the National Assessment, is used to measure cognitive learning outcomes that measure a student's reading literacy and mathematical literacy (numbering) [1]. Literacy and numeracy are fundamental abilities or competencies required of all students, regardless of their future profession or goals. Furthermore, these two competencies must be developed across subjects, not just in Indonesian and Mathematics classes [3]. It also aims to encourage teachers of all subjects to place a greater emphasis on developing reading skills and logical-systematic thinking. Literacy is defined as the ability to understand, use, evaluate, and reflect on various types of texts in order to solve problems and develop individual capacities as Indonesian citizens and global citizens in order to contribute productively to society in the minimum competency assessment. Meanwhile, in the Minimum Competency Assessment, numeracy is defined as the ability to think using concepts, procedures, facts, and mathematical tools to solve everyday problems in a variety of contexts relevant to individuals as Indonesian and global citizens [4]. Before students can solve problems in everyday life, prospective elementary school teachers, who are also students of elementary school teacher education, must be trained to solve problems in daily activities, particularly in subjects containing mathematics. Problem solving in mathematics involves a Polya theory, which carries four stages in problem solving that are nearly identical to information skills (literacy) that students must master. The four stages are as follows: (1) understand the problem; (2) devise plans; (3) carry out the plan; and (4) look back [5].

Furthermore, an approach that can be used to develop problem-solving skills, critical thinking, creativity, teamwork, and cognitive flexibility is required. Realistic Mathemtics Educatoon is a method for dealing with contextual or everyday problems, as well as in mathematics. Realistic Mathemtics Educatoon is one approach to mathematics learning that tries to use students' experiences and surroundings as primary teaching aids [6]–[8]. This is also consistent with the literacy and numeracy components included in the Minimum Competency Assessment, namely: (1) content, for literacy, informational texts and literature, and numeracy, algebra, numbers, geometry, data measurement, and uncertainty; (2) cognitive processes, for literacy, finding, interpretation and integration,

evaluation and reflection of information, and numeracy, understanding, application, and reasoning [1]. The presence of a Student Worksheet is one component that can support the learning process for students by allowing them to practice problem solving skills. This is because the worksheet can see the process of learning rather than just the results. As a result, an assessment rubric will be included in a worksheet in order to evaluate the process of students or students who participate in worksheet-based class activities [9]. Furthermore, worksheets can help to develop thinking skills and concretize concepts, as well as invite students or students to participate in an activity to solve problems in everyday life and provide solutions to these problems [10].

The researchers conducted a study that aimed to develop Student Worksheets with a Realistic Mathematics Approach based on Problem Solving in response to the needs of elementary school students for problem solving skills related to daily activities, beginning with the teacher's ability.

2. METHOD

The research and development method was used in this study. There are various types of models in research and development methods. The model employed is the creation of a four-dimensional model. The 4-D development model (Four D) is a model for developing learning devices [11]. The 4D development model is divided into four stages: define, design, develop, and disseminate. This method and model were selected because they aim to create a product in the form of student worksheets.

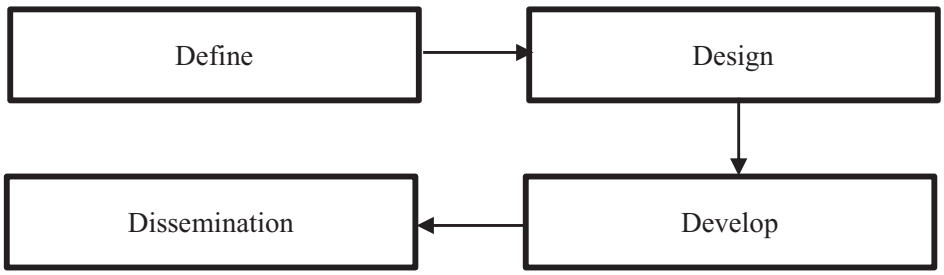

Figure 1: 4D development chart.

However, due to time constraints, the fourth development stage was modified in this study. The modification is accomplished by shortening the final stage, namely dissemination, resulting in this development stage being 3d.

3. RESULTS AND DISCUSSION

3.1. Result

This investigation starts with the defining stage. This stage defines the following terms: 1) the definition of realistic mathematics, which is the linking of all learning, particularly mathematical theory, into everyday contexts so that mathematics no longer has abstract meaning; 2) problem solving, specifically following Polya's problem-solving stages of understanding the problem, devising a plan, carrying out the plan, and looking back.

The following stage is design. Some of the things that are designed during this stage include creating student worksheets based on the topics that will be covered at each meeting. Students will be presented with an illustration of everyday life, in this case, life as a student, at the start of the meeting. The illustration contains a problem that students must solve before proceeding with activities on student worksheets. The illustrator and the researcher discuss the illustration design that will be described in the student worksheet.

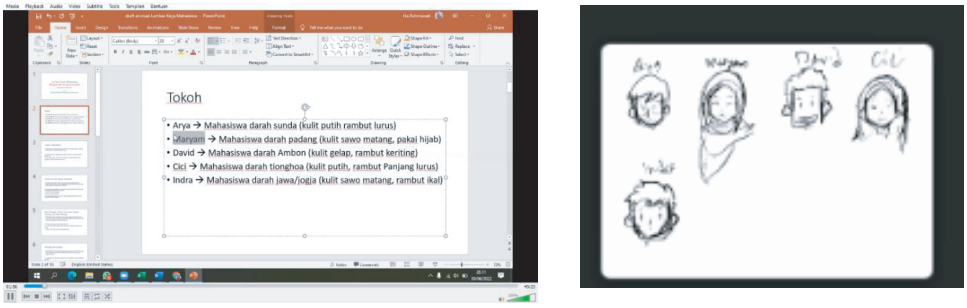

Figure 2: designing the character on worksheet.

The next stage is developing. At this point, the researcher works with an illustrator to create a mathematically realistic-based worksheet. Begin by designing a cover for student worksheets by describing the five characters of students majoring in primary school teacher education, each with a unique set of characteristics, as designed in the design section.

Following the successful development of the cover, the process is carried on by designing student activities for each chapter. This Student Worksheet is intended to aid and supplement lectures in Numbers and Data Processing Courses. Some of the chapters contained in one semester lesson plan for Numbers and Data Processing courses include: 1) Mathematical Logic; 2) Sets and Relationships of Sets; 3) Number Base, Numerical System, Roman System, and Place Value; 4) Rank Numbers; 5) Natural and Whole Numbers and their Calculation Operations; 6) Integers and their Calculation

Figure 3: cover design of the worksheet.

Operations; 7) Prime Numbers and Composite Numbers; 8) LCM and GCF; 9) Real Number System; 10) Data Concepts; 11) Data Presentation; 12) Measure of Central Tendency - Mean; 13) Measure of Central Tendency - Median and 14) Measure of Central Tendency - Mode.

Each chapter always begins with an illustration of a picture that describes the real conditions of students majoring in elementary school teacher education's daily activities. Students will understand that mathematics can be taught using the implementation of daily activities if a chapter begins with illustrations of daily activities. Furthermore, the illustration includes a problem that concludes with a question word or a statement that must be proven true or the problem solved by students. This will also help students understand everyday problems, which will be taught to elementary school students.

Some of the students' daily activities are depicted according to the topic of the material to be studied, out of the 14 sub-themes that will be studied by students.

Following the completion of the sketch process from images representing 14 daily activities based on sub themes, the next step is to perfect the image and begin coloring some images. All of the images used as illustrations before studying the material for each chapter are from everyday life and depict realistic mathematics. A conversation between characters or characters, namely students majoring in elementary school teacher education, is depicted in the image. The conversation contains an unresolved problem, and the next step requires the students to complete some worksheet activities.

Figure 4: drawing sketch development process.

Figure 5: illustration of daily problems at the beginning of the chapter.

3.2. Discussion

It is able to train students to get used to bringing mathematical theory concepts to students later in elementary school by presenting daily activities to understand students' mathematical material, from developing realistic math-based student worksheets to developing problem-solving skills. Students will understand that mathematics is not an abstract concept that does not exist in everyday life if daily activities are presented to them. This is consistent with Zakaria's and Lestari's assertion [12], [13] that realistic

mathematics can improve students' understanding of mathematical concepts as well as their learning outcomes.

Furthermore, the problems depicted in the illustration but not immediately solved will provoke and train students' critical thinking skills as well as problem-solving abilities. The activities in the worksheets will also engage students in problem solving that is more than just doing math problems. This is consistent with the findings of Chikiwa's and Ibrahim's research [14], [15], which show that problem solving that starts with a question to provoke students to solve it can improve students' critical thinking skills.

Shim's research [16] backs this up, stating that learning activities at the university level that train students' critical thinking skills will have a similar effect when these students have direct experience and practice in the field or elementary school. This is due to the fact that these habits will always carry over and serve as the foundation of a good foundation, particularly for elementary school students.

4. CONCLUSION

The use of Student Worksheets with a realistic mathematical approach based on problem solving by Elementary School Teacher Education Students as a basis for habits that have been ingrained from an early age, so that later they will be able to apply similar things when they have practiced learning in the field, is the result of this research. By training students as prospective elementary school teachers to think realistically in mathematics by presenting a realistic math-based worksheet and having them solve the problems on the worksheet, students will receive basic training that will later be transmitted to students in elementary school, as a foundation for these students to adapt to government policies that enforce AKM as a measuring tool for students' numeracy literacy skills.

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