Effectiveness Of Student Worksheets Based On Problem Solving On Fraction Materials In 5th Grade Elementary School

Gevin Rifauldy Lopez[1]✉, Tatang Herman[2]
[1,2] Basic Education, Universitas Pendidikan Indonesia, Bandung, Indonesia
✉ gevinrl04@gmail.com

Abstract. This research is motivated by the fact that not many schools implement Student Worksheets by the requirements and steps for preparing Student Worksheets The existing Student Worksheets, in general, have not been able to facilitate students in increasing knowledge and higher-order thinking such as problem-solving. This study aimed to see the Effectiveness Of Student Worksheets Based On Problem-Solving On Fraction Materials In 5th Grade Elementary School. This study uses the ADDIE development model, from Branch (2009:2) which has 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. However, in this study, limited trials were carried out due to the Covid-19 pandemic whose cases continued to increase. This study was validated by 3 experts, namely material experts, media experts, and classroom teachers. The results of material validation have a score percentage of 78.35% included in the effective category. The results of the media expert's validation obtained a score of 86.40% in the effective category. And the results of the confirmation of the fifth-grade elementary school teacher. get a score of 91.98% in the effective category. From the overall validation results, student worksheets can be declared feasible and effective to be used as teaching materials and can be used for the public.

Keywords: Worksheet, Effectiveness, Problem-Solving, Addition of Fractions with Different Denominators, ADDIE

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INTRODUCTION

Various processes in developing students as the nation's successors have been carried out a lot, and many of these things are contained in policies and rules that are used as guidelines in school learning. Interpretation related to learning can be said as an activity with the goal that students can receive and internalize the knowledge and values in it. Therefore, first and foremost, teachers are required to have sharpness in seeing the characteristics and abilities of students in a comprehensive manner. In addition, the teacher's success in learning can be seen from how he conducts the teaching process, and qualified teachers can be sure to use learning media devices to support successful learning.

In modern education or the 21st century, learning tools determine the success of learning, including learning media, lesson plans, and cognitive, affective, and psychomotor assessment sheets. The learning tools that are often used are Student Worksheets which contain the stages of understanding concepts independently.

Schools generally use Student Worksheets which contain questions but do not lead to problem-solving or problem-solving. The concept of a problem-solving-based Student Worksheet is to encourage students to be able to carry out the process of learning activities by finding a particular concept and being able to find problems independently. As Prastowo (2014) revealed Student Worksheet contains activities that involve a lot of students so that they are active in the learning process.

Mathematics as a science must be understood by students because mathematics as a science is not only a mere concept of numbers, but mathematics is related to everyday life, so it needs good reinforcement in understanding the material. Therefore, students are required to have and master the ability to process data, analyze concepts, and so on. As one of the goals of understanding mathematics is an understanding of the concept, innovation regarding the manufacture of Student Worksheets is very necessary. Efforts can be made by building Student Worksheets that are based on solving problems. Because the goal is to avoid student worksheets that contain only practice questions but contain systematic steps for students to interpret the material independently.

There is a survey of the study (PISA) Program for International Student Assessment conducted by the OECD (Organization for Economic Co-operation & Development) in 2015, where Indonesia was ranked 69th out of 76 countries worldwide. Based on the survey, Indonesian education has the low ability, especially in learning mathematics.

Looking at the data contained in the survey, it is a hard slap for Indonesian education, of course, so many factors influence it, simple factors, for example, the many students who do not like and think mathematics is scary and difficult to understand. This is indicated by the low results of students' mathematics learning and their understanding of mathematics which is relatively low. In addition, there are many facts seen in the field that students experience errors in understanding mathematics. Based on the description above, the mistakes made will become habituation, if they are not aligned with systematic mathematical concepts as they should be.

As an effort to find novelty in the process of making a Student Worksheet, it can be based on one learning strategy. Because Student Worksheet is based on one learning strategy, it will be more effective and optimal in its use. For example, for example, problem-solving-based learning strategies.

The form of innovation in designing Student Worksheets is conducting Student Worksheets based on one learning strategy. With Student Worksheet based on a learning strategy, it will have an optimal impact on its use. Specifically, there are learning strategies that can make students able to solve learning problems, one of the learning strategies is (Problem Solving). Thus, the core of the problem is to see the effectiveness of problem-solving-based Student Worksheet products in 5th-grade elementary school.

Talking about problem-solving Kunandar (2011) reveals that as a learning strategy problem solving always presents learning in schools with problems that occur in life as benchmarks so that students are able to think critically and are skilled at solving problems. Therefore, in learning, problem-solving will be different from other learning. This can be seen from learning, where learning usually begins with the provision of material, but it is different from solving problems because the problems that will be given at the beginning of learning are not material. Based on the description above, the enthusiasm and curiosity of students develop, in order to be able to solve the problems given by the teacher, so that learning will be meaningful for them. In compiling worksheets based on problem-solving strategies, where the problem becomes the starting point, it can be used as a teacher's solution, to produce critical, creative, and meaningful learning. This is because the problems experienced by students every day and problems related to concrete objects can be easily understood by students. As Rusman (2012) revealed that the benefits of learning based on problem-solving can improve communication relationships between students, and grow group performance and interpersonal skills. To solve problems based on learning strategies (Problem Solving) or problem-solving by obeying laws such as data collection, identification, hypotheses, investigations, and conclusions. Wena (2013) revealed that the problems presented are contextual, non-routine, and open-ended. Therefore, problem-solving systematically will make students find answers to problems given independently. In addition, these steps can be regarded as guidance, to be able to achieve the specified competency achievement indicators.

There are four indicators of problem-solving strategies put forward by Polya (1957) including (1) understanding the problem, (2) searching for and compiling solutions to solve problems, (3) carrying out activities on solutions that have been made, (4) re-checking problem-solving. So, the preparation of the Student Worksheet based on problem-solving is required to be following the terms and conditions. Prastowo (2014) revealed that there are three eligibility criteria including didactics, construction, and techniques. Based on the description above, through the three problem-solving-based Student Worksheet requirements, always encourage students to understand the concept of learning material.

METHODS

This research method is the Design and Development (D&D) method through a qualitative approach. While the ADDIE model, this model has stages namely Analysis, Design, Development, and Implementation. The ADDIE development model is a model that is used to see the creation of

certain products based on innovative learning. Therefore, this research is intended to see the effectiveness of the product and the results of the due diligence of the product. So this research will produce Student Worksheets Based on Problem Solving on the Addition of Fractions with Different Denominators in 5th Grade Elementary School.

Based on the location of this research, was conducted in a place adjacent to the researcher's residence. The research conducted by the researcher took approximately eight months from January 2021 to August 2021. In addition, the respondents who were taken by the researcher were fifth-grade elementary school students and the validator consisted of expert material, media, and teachers. The first research procedure is the analysis phase, which is a stage that identifies gap problems. This stage tries to see the problems that occur and provide solutions so that they can be resolved and determine the competence of students.

The second stage designs, where designing student worksheets based on what has been seen before so that this planning is carried out by selecting the necessary aspects, for example compiling a concept map of student worksheets and their framework, this stage requires researchers to prepare instruments, so that can assess the feasibility of student worksheets that have been developed so that the eligibility can be seen from the content, presentation, graphics and according to the strategy used.

The third stage is Development, where at this stage the existing Student Worksheet is designed previously so that it will be validated by lecturers and class teachers, as input and suggestions to be able to design a better Student Worksheet, so in this stage, the validation will continue until it reaches a usable product.

The fourth stage of Implementation, where this stage is limited to schools that have been designated as research locations, in implementation it can be said to be the product trial stage, due to the increasing spread of Covid-19 cases, product trials are carried out in a limited manner, only on a few students.

The fifth stage is Evaluation, where this stage carries out the last revision carried out by the researcher on the Student Worksheet he developed, based on the results of the revision or input from the questionnaire filled in by the validator and students' responses to the Student Worksheets.

RESULTS

In this chapter, the researcher will present the findings and discussion based on the research stages of the ADDIE development model. The ADDIE development model consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. The product produced in this study is Student Worksheets Based on Problem Solving in 5th Grade Elementary School. The following are the results of the research according to ADDIE's steps:

1. A. Student Worksheet Development and Results
    1. Analysis

a. Needs Analysis

The needs analysis stage was carried out by conducting non-formal interviews with fifth-grade elementary school teachers. and analyze the Student Worksheet used by the school. Interviews were conducted aiming to determine the effectiveness of the use of Student Worksheets in schools. In addition, it also analyzes the contents of the Student Worksheet used by the school. Based on the results of the interviews, it was found that the Student Worksheet in schools only used student books from the Ministry of Education and Culture. Based on the Student Worksheet analysis, it was found that schools did not meet Student Worksheet standards and were not based on problem-solving.

b. Analysis of Student Characteristics

This stage aims to observe the character of students toward learning. Based on the results of the observations obtained, the characteristics of the students who were at the school still did not like learning mathematics and many students experienced a misconception regarding the material for the Addition of Fractions with Different Denominators.

c. Curriculum Analysis

At this stage, the aim is to see the characteristics of the curriculum used by the school. Based on the results of non-formal interviews, it turns out that the school uses the latest curriculum, namely the 2013 revised 2018 curriculum. Then for the selection of Basic Competency, it is also based on Permendikbud No. 37 of 2018.

2. Design

This planning stage is carried out by determining the elements needed in the preparation of Student Worksheets. The steps for compiling Student Worksheets according to Prastowo (2011) are:

a. Conduct Curriculum Analysis

In this curriculum analysis, the researcher chose Basic Competency and the material to be made in the following Student Worksheets:

Basic Competencies

3.1 Explain and add and subtract fractions with different denominators **4.1 Solving problems related to the addition and subtraction of two fractions with different denominators**

Prerequisite Material	**Addition and Subtraction of Fractions with the same denominator**
Core Material	Adding Fractions with Different Denominators
Subtracting Material	Fractions with Different Denominators

b. Arrange Student Worksheets Requirements

1) Selection of Student Worksheets format

At the stage of choosing the format, it is adjusted to the elements or structure of the Student Worksheets and the requirements that must be met in the preparation of the Student Worksheets, including didactic, construction, and technical requirements.

2) Media Selection

The selection of media for Student Worksheets must be adjusted to the material for learning mathematics in 5th-grade elementary school namely the material for the Addition of Fractions with Different Denominators. Besides that, they are also looking for media that is easy to use for fifth-grade elementary school students. Then the selected media is media that has instructions for use as well as tools and materials that are easy to find in the surrounding environment.

c. Determine the Student Worksheets Title

At the stage of determining the title of Student Worksheets can be determined from Basic Competency, subject matter, or knowledge contained in the curriculum. Therefore, the title of the Student Worksheets taken is "Add Fractions with Different Denominators".

d. Student Worksheets writing

Steps for Writing Student Worksheets:

1) Formulate Basic Competency
2) Assessment Sheet
3) Compile Teaching Materials
4) Pay attention to the structure of Student Worksheets

3. Development

At this stage according to the previous design. The activities at this stage are carrying out the final design of the Student Worksheets and conducting validation tests for material experts, media,

and class teachers. The process of this activity lasts until the Student Worksheets can be said to be valid and suitable for use by schools and the general public.

a. Final Design

At this final design stage, the researcher added interesting elements to the Student Worksheets including animated images and interesting backgrounds for students to see. Animation and background obtained from manypixels.com. and freepick.com which has obtained a free license and has the right to edit and use it for personal purposes

b. Assessment of Student Worksheets according to experts

1. Expert Validation Results

The validity of material experts, media, and teachers of 5th-Grade Elementary School. As for the Student Worksheets assessment that was obtained, it was then analyzed descriptively, and the scores on each component were validated. The validation assessment criteria by the validator can be seen in the following table:

Tabel 1. Category

Evaluation Score	Category
4	Very Suitable
3	Suitable
2	Unsuitable
1	Very Unsuitable

The next score obtained is calculated by the following formula:

$$\text{Validity Score} = \frac{\text{Total score obtained}}{\textit{Maximum total score}} \text{ x } 100$$

Source: Modification of Riduwan (Naziyah, 2014)

After the results of the validity data are obtained, the total score obtained is as follows:

Expert	Percentage Validation Result	Validation Process
Material	78,35%	Once
Media	1st: 77,27% 2nd: 100 %	Twice
Teachers of 5th Grade Elementary School	1st: 90,50% 2nd: 93,35%	Twice

Based on the results of validity data, the value becomes qualitative and the student worksheets used need to be appropriate based on the eligibility category. The characteristics of student worksheets based on a collection of decisions can be seen below this table:

Student Worksheet Eligibility Category

Score Average Interval	Category
81% - 100%	Very Good
61% - 80%	Good
41% - 60%	Acceptable
21% - 40%	Poor
0% - 20%	Very Poor

. Source: Riduwan (in Naziyah, 2014)

So that the results of the three validations of material experts, media and class teachers are declared feasible and in accordance with the steps for preparing Student Worksheets and the requirements for preparing Student Worksheets. The resulting Student Worksheets can be used and distributed in a wider school.

2. Implementation

At this stage, it was carried out in a limited manner at the school designated as the research location. The research was conducted in a limited trial with a student with the initials DAM. The purpose of this activity is to find out the quality and effectiveness of the Student Worksheets that have been produced. The following is the student's response to the readability that has been produced.

Assessment Item	Alternative Answer			
	SS	S	KS	TS
a. Interest - Interesting student worksheet display.	✓			
-Student Worksheet makes me excited to learn mathematics.	✓			
-Using Student Worksheet can be able to change my mindset toward learning mathematics.		✓		
-This Student Worksheet helps me understand mathematics, especially about fractions.	✓			
-The illustrations on the student worksheet can motivate me to understand fractional material.	✓			
b. Material -The material presented in student worksheets is related to everyday life.	✓			
-The material presented in the student worksheets is easy for me to understand about fractions.		✓		
-Student worksheets as a whole or the steps can make it easier to find concepts.	✓			
-The student worksheets presented are able to encourage, so they can discuss with friends.	✓			
- Student worksheets have blank charts which can provide space to write down material concepts that are already understood.		✓		
- This Student Worksheet is able to encourage conclusions from all the activities that have been carried out and the material concepts that have been understood.	✓			
- This Student Worksheet contains questions that can test the level of understanding of the material that has been studied for addition of fractions with different denominators.	✓			
- c. Language: The sentences and words in the student worksheet are so simple and understandable.	✓			
The language that is there and used is very understandable.	✓			
The letters in the Student Worksheet are very simple and easy for me to read.	✓			

3. Conclusion

The making of this Student Worksheet is based on a problem-solving learning strategy, where the Student Worksheets product is based on the addition of fractions with different denominators. The form of this portrait Student Worksheet consists of 39 sheets. Making Student

Worksheets is based on conditional preparation steps. As Prastowo (2014) revealed that the Student Worksheets have been designed, and the Student Worksheets can be validated by material experts, media, and class teachers. based on the validation results and student responses, this Student Worksheets product is suitable for use in the learning process at school.

CONCLUSION

Based on the findings and discussion in this study regarding the effectiveness of problem-solving-based worksheets on the addition of fractions with different denominators in 5th-grade elementary school, it is described as follows:

1. In the first stage, the Student Worksheets development process is carried out by determining the aspects needed in its preparation. As for the steps expressed by Prastowo (2014) by conducting an analysis of the curriculum, compiling the Student Worksheets requirements contained therein related to the Student Worksheets format and media selection, determining the title of the Student Worksheet, the last is writing the Student Worksheet which includes basic competency formulation activities, assessment sheets, preparation of material and structure in Student Worksheets.
2. In designing this Student Worksheet, the researcher chose the theme "Fun Mathematics" and the material taken was "Add Fractions with Different Denominators". The results of the development of this Student Worksheet are based on the eligibility requirements of the Student Worksheet, namely the ditactic, construction, and technical requirements. This Student Worksheet is designed or developed based on problem-solving indicators. As Polya (1957) revealed that there are four steps including understanding the problem, compiling a solution to the problem, implementing the solution to the problem, and verifying the solution to the problem. In addition, the Student Worksheet used has various forms, where Student Worksheets I and III are Student Worksheets that help students find a concept. Student Worksheets II and IV are tools that function to provide practical instructions.
3. Based on the description above, the design of the Student Worksheet based on this problem solving is able to effectively and systematically provide facilities to students, to understand concepts and develop high-level thinking skills, so that learning that occurs is fun and has meaning.
4. Based on the validation results that have been given by experts, which have been discussed in the discussion. The results of validation results from the Student Worksheet media experts have a very decent predicate with a value of 86.40%. The validation results from the Student Worksheet material expert have a proper predicate with a value of 78.35%. While the validation results from the Student Worksheet class teacher have a very decent predicate with a value of 91.98%. Therefore, judging from the overall results of the validation above, this Student Worksheet is said to be appropriate and effective for use as teaching material.

In addition, it can be strengthened by the opinion of Trianto (2009) which states that Student Worksheet can be declared as a good category if it obtains a minimum score of 75% based on expert validation. This Student Worksheet can be said to be feasible and effective because it is by the requirements for preparing Student Worksheet, namely construction, didactic and technical requirements. This was reinforced by Hendro Darmodjo and Jenny R.E. Kaligis who revealed that a student worksheet can be said to be feasible if it meets the didactic, construction, and technical requirements (Widjajanti, 2008)

Therefore, the results of the findings and discussion that have been described above, it can be concluded that the results of the research regarding (Effectiveness of Problem Solving-Based Worksheets on the Addition of Fractions with Different Denominators in 5th-Grade Elementary School) developed by researchers are said to be appropriate and effective for use in schools and can be disseminated based on the agreement of experts.

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