

Development of Smart Stairs Learning Media Integrated with Problem Based Learning

by Sumardin Raupu

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Sumardin Raupu^{1, a)}, Sakinah^{2, b)}

Author Affiliations

¹Institut Agama Islam Negeri Palopo

²Institut Agama Islam Negeri Palopo

Author Emails

^{a)}sumardin_aldhy@iainpalopo.ac.id

^{b)}sakinahali97@gmail.com

Abstract. This study discusses about the development of smart stairs learning media for length unit measurement materials integrated with problem based learning in third grade students of SDN 50 Bulu Datu. This study aims (1) to determine the procedure for developing smart stairs learning media integrated with problem based learning. (2) to know the validity of the smart stairs learning media for length unit measurement materials integrated with problem based learning. The type of this research is research and development (R&D). Researchers refer to the ASSURE model with five development steps, namely Analyze learner characteristics, State objectives, Select methods, media and materials, Utilize media and materials, Require learner participation and Evaluate. However, researchers only conducted research up to the Select Methods, media and Materials step. The research was conducted at SDN 50 Bulu Datu with the research subjects were third grade students. To determine the level of validity of the developed product, validity tests were conducted by validators of material experts, media experts, and subject teachers. The results of this study indicate that the Smart Stairs learning media integrated with Problem Based Learning is a very valid category to be used in learning seen from the assessment of material experts (91.6%) with a very valid category, media experts (90%) very valid category, subject teachers (95.8%) category is very valid.

INTRODUCTION

Learning carried out at every level of education, from basic education, secondary education to higher education is competency-based learning. This shows that students are expected to be able to achieve the minimum standards that have been determined by the education unit. Students are also expected to be able to master the materials or learning concepts as a whole and comprehensively so that effective learning is needed. Effective learning is learning condition of the students to achieve maximum progress according to their abilities. A good teacher always tries to create effective learning. In fact, not all students can achieve maximum progress in the learning process.

The Learning patterns that are still often used by most teachers, especially in elementary schools, does not consider the age of the students. Without realizing it, the delivery of material tends to be abstract by only displaying complicated numbers and it has forced children to think hard. According to Piaget, MI or SD students range from 7-8 years, to 12-13 years, they are in the concrete operational phase. Basically, children learn through concrete things to understand abstract mathematical concepts. Children need concrete objects as intermediaries or media. These objects are usually called learning media. The using of media is not only the formation of children's concepts but also can be used for understanding concepts, training, and strengthening, serving individual differences, problem solving, and so on.¹

According to Rossi and Breidle, learning media are all tools and materials that can be used for educational purposes, such as radio, television, books, newspapers, magazines, and so on. Tools such as radio and television when used and programmed for education are learning media.² Thus, teachers must be able to develop learning

¹ Deti Rostika and Herni Junita, "Peningkatan Kemampuan Pemecahan Masalah Siswa SD dalam Pembelajaran Matematika dengan Model Diskursus Multy Representation (Dmr)," *EduHumaniora / Jurnal Pendidikan Dasar Kampus Cibiru* 9, No. 1 (2017): 35, <https://doi.org/10.17509/eh.v9i1.6176>.

² Ni Putu, et al Lisdayanti, "Pengaruh Model Pembelajaran Kooperatif Talking Stick Berbantuan Media Gambar terhadap Hasil Belajar Ipa Siswa Kelas V SD Gugus 4 Baturiti," *Journal Mimbar PGSD Universitas Pendidikan Ganesha* 2, No. 1 (2014), <https://ejournal.undiksha.ac.id/index.php/ijpgsd/article/view/2017>.

media, one of which is media that is adapted to the real life of students. The role of the teacher is very important in this case, because students' creative thinking depends on how the teacher creates a new atmosphere so that teachers are required to be able to think more creatively and innovatively in using learning media to support student creativity in teaching and learning process.

Based on observation and interview results on September 19, 2020 at SDN 50 Bulu Datu Palopo with 23 students, it was found that the ability of class III students on measure unit length material in mathematics subject was still very low, there were 30% of students who had understood and 70% of students who did not understand. Students also have different abilities in the class. The low student mastery of measuring unit length material is caused by several factors, both from teachers and students. These factors include the limitations of teaching materials prepared by the teacher, the learning atmosphere is very boring and students only play in the classroom during the learning process. It can be seen from the number of students who have not been able to reach the KKM that has been determined when students complete the questions given by the teacher.³

Prior to this research, there were already several researchers who had discussed the same problem from various perspectives. Almost every study states different results from their respective studies such as the research by Harry Prima Putra and Wahyu Pujiyono, under the title Design and Development of Mathematics Learning Applications on the Measurement of Time, Length and Weight for Elementary Schools (SD) Grade II. The equation of this research is to produce products of media and technology. However, Multimedia is based on measuring time, length and weight. Meanwhile, this research developed a learning media integrated with Problem Based Learning.

The second research was conducted by Sandrita Rusdiana Dewi, under the title Development of Straight Line Learning Media in the Material of Measurement of Length Units for Class III Elementary School Students. Previous researchers wanted to produce a product in the form of learning media with the Bord and Gall development model. While this research uses the ASSURE development model.

The third research by Umi Mukhlisoh, under the title Development of Learning Media for Units of Length and Units of Weight Based on mnemonics Strategy in Grade IV Elementary School. The similarity of the research carried out is the using of the R&D development model. The difference is that previous researchers discussed the material for units of length and units of weight based on mnemonic strategies. Meanwhile, this research only discusses the material about measuring unit length integrated with problem based learning.

Based on the explanation above, the researchers are interested in studying the development of smart stairs media on measuring units of length material integrated with Problem Based Learning which is adapted to the conditions of students in real life.

RESEARCH METHOD

This study uses a type of research and development (R&D) known as development research. In this R&D study, the Assure research model is in accordance with the criteria for developing smart stairs learning media that focuses on measuring the unit length material integrated with problem-based learning in third grade students of SDN 50 Bulu Datu. This study uses the ASSURE development model which has 6 stages, namely analyzing student characters, stating goals, selecting methods, media and materials, utilizing media and materials, requiring students participation, evaluating. However, in this current situation and conditions, which are currently in a state of the Covid-19 pandemic, researchers only use 3 stages including analyzing the characteristics of students analyzing student characters, stating goals, selecting methods, media, and material.

The subjects in this study were the third grade students of SDN 50 Bulu Datu Palopo, totaling 23 people. This data collection technique consists of several instruments such as a needs analysis questionnaire in the form of teacher and student interviews. The two validation questionnaire sheets in this stage went through a validation test process by several validators including material expert validators, media experts, and elementary learning experts.

Data analysis is an activity carried out after data from all respondents and other data sources are collected. Data analysis techniques to be carried out in this study are as follows:

1. Validation Analysis

The data from the validation results of the experts were analyzed by considering the input, comments, and suggestions from the validator. The results of the analysis are used as guidelines for revising the product.

Each validator will be given a validation sheet for each instrument to be filled in with a check mark on a Likert scale 1-4 as follows:

Score 1: invalid
Score 2: less valid
Score 3: quite valid
Score 4: valid

The validation data from the three validators were analyzed by considering the inputs, comments and suggestions from the validators. The results of the analysis are used as guidelines for revising the product or instrument. Furthermore, based on the validity sheet that has been filled in by the validator.

The validity data analysis technique is from the tabulation results by the validators, the percentage is sought by the formula:⁴

$$\text{Persentase} = \frac{\sum \text{skor per item}}{\text{skor maksimum}} \times 100 \%$$

Based on the percentage results then categorized according to the following table:

TABLE 1. Validation Category⁵

%	Kategori
0 – 20	Invalid
21 – 40	Less Valid
41 – 60	Quite Valid
61 – 80	Valid
81 – 100	Very Valid

RESULT AND DISCUSSION

The results of learning media developments are carried out based on the development procedure of the ASSURE model, namely analyze learner characteristic (analyze student character), state objectives (state objectives), select methods, media and materials (choose methods, media and materials), utilize media and materials (use media and materials), require learner participation (ask for student participation), evaluate (assess). However, in this research, the researchers only developed to the stage of Select methods, media and materials.

1. Analyze Learner Characteristic

In Analyze Learner Characteristics there are several stages including, analysis of student needs, and analysis of general characteristics of students.

a) Students need analysis

Based on the results of interviews with students regarding the length unit measurement material, it was found that these students were very difficult in working on story exercise form, and they were also more interested in learning if they used learning media like audio-visual (sound and pictures) with moving animations. The students also said that one of the reasons they like audio-visual learning media is because they equate it with watching TV so that all students are focused on the media.

b) Analyze Students General Characteristic

This stage is to analyze the character of students towards mathematics learning in class. The following is the student's test scores, namely:

⁴Siti Fajar Aldilha Yudha, Asrul, and Zuhendri Kamus, "Pembuatan Bahan Ajar Fisika Berbasis Video menggunakan Sparkol VideoScribe untuk Pembelajaran Fisika Peserta Didik Kelas X SMA," *Pillar Of Physics Education* VIII (2016): 154, <http://ejournal.unp.ac.id/students/index.php/pfis/article/view/2476>.

⁵ Nilam Permatasari Munir, "Pengembangan Buku Ajar Trigonometri Berbasis Konstruktivisme dengan Media E-Learning pada Prodi Tadris Matematika IAIN Palopo," *Al-Khwarizmi: Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam* 6, No. 2 (2018): 167–78, <https://doi.org/10.24256/jpmipa.v6i2.454>.

Table 2. Students' Test Values List of Grade III B

No.	Students Name	Daily Test/Task			Average
		1	2	3	
1.	Aqliansyah Anugrah	65	65	65	65
2.	Alvino Bhayangkara	65	75	65	68,3
3.	Brayean	70	60	70	66,6
4.	Doni Yakhin Tabian	70	70	63	67,7
5.	Muhammad El Hafizh	75	65	65	68,3
6.	M. Jibril Abraham	75	75	72	74
7.	Muh. Zakhy Pratama	80	80	73	77,6
8.	Marchello	70	70	60	66,6
9.	Qaizer Ali Aqeef	75	70	62	69
10.	Samudra Al Wali	70	65	60	65
11.	Wishar Martir	80	70	70	73,3
12.	Benaya Julieta	75	65	64	68
13.	Dera Alica Rasuanti	70	62	75	69
14.	Farah Syahputri	85	80	75	80
15.	Intan Nabila	70	70	63	67,7
16.	Joan Claudia	70	70	65	68,3
17.	Kristin Oktaviani	70	65	70	68,3
18.	Samiyyah Al Hamid	70	75	65	70
19.	Thysia Yuliandry	70	70	63	67,7
20.	Tiara Putri Paska	65	65	65	65
21.	Vilencia Christiany	70	80	60	70
22.	Zikra Nafia Putri	80	75	70	75
23.	Leri Rivano	70	70	71	70,3

Based on the data of the student's test scores result, it can be concluded that, in learning mathematics, there are 78% of students with scores below the standard, and 21% of students who achieve the minimum completeness criteria (KKM). This is because many students are not interested in learning mathematics due to the thick textbooks that make students afraid to learn it. When working on assignments, only some students work on questions, most of these students often wait for answers from smart students. Therefore, the curiosity of students in learning mathematics really needs to be developed. It is needed to make interesting media for students.

2. State Objectives

The next step is to formulate learning objectives and basic competencies. The formulation of learning objectives is intended to formulate learning objectives. The learning objectives to be achieved are students can convert the unit value of length, and students are able to solve problems related to daily life regarding length appropriately.

3. Select Methods, media and Materials

The learning media developed in this study were audio-visual in two-dimensional form by displaying animation, sound and images that could attract students' attention, containing material and examples of questions about measuring units of length related to everyday life. The display or learning media for smart stairs integrated with problem based learning can be seen in the following figure:



(a) (b)
FIGURE 1. Contents of Length Unit Measurement Material

Before teacher and students tested the learning media, the developed learning media were validated by three validators, namely material experts, media experts and elementary learning experts. This validation was carried out to obtain data about the feasibility of smart stairs learning media. The validation results can be seen as follows:

TABLE 3. Expert Material Validation Result

No	Rated aspect	Score	Max Score	%	Category
1.	The Smart Stairs Learning Media used is in accordance with the subject matter	4	4	100	Very Valid
2.	The Smart Stairs learning media used is in accordance with the learning objectives	4	4	100	Very Valid
3.	The using of Smart Stairs Learning Media used in accordance with Basic Competencies	4	4	100	Very Valid
4.	The suitability of practice questions with the material	4	4	100	Very Valid
5.	The Smart Stairs Learning Media used can provide illustrations that match the actual situation.	3	4	75	Valid
6.	Smart Stairs learning media can make it easier for students to imagine	3	4	75	Valid
Amount		22	24	91,6%	Very Valid

Based on the results of validation by material experts, it is known that the smart stairs learning media in the developed length unit measurement material has a percentage of 91.6% with a very valid category. Thus the developed smart stairs learning media can be used in the learning process.

TABLE 4. Expert Media Validation Result

No	Rated Aspect	Score	Max Score	%	Category
1.	The appearance of learning media attracts students' attention	4	4	100	Very Valid
2.	Smart Stairs learning media is easy to use	4	4	100	Very Valid
3.	The learning media used is not easily damaged	4	4	100	Very Valid
4.	The use of Smart Stairs learning media can reduce students' dependence on teachers	3	4	75	Valid
5.	The use of Smart Stairs learning media can prevent misinformation that occurs in students	3	4	75	Valid
Amount		18	20	90%	Very Valid

Based on the results of validation by media experts, it is known that the smart stair learning media in the developed length unit measurement material has a percentage of 90% with a very valid category.

TABLE 5. Elementary Learning Expert Validation Results

No	Rated Aspect	Score	Max Score	%	Category
1.	The suitability of the material with the basic competencies, indicators, and learning objectives	4	4	100	Very Valid
2.	The suitability of the material presented using the Smart Stairs learning media on the length unit measurement material.	4	4	100	Very Valid

3.	The material is easy to be understood	4	4	100	Vey Valid
4.	Clarity of the material with the questions given	4	4	100	Very Valid
5.	Accurate selection of materials can foster students leaning interest and motivation	3	4	75	Valid
6.	Giving sample exercise of the material	4		100	Very Valid
Amount		23	24	95,8%	Very Valid

Based on the results of validation by elementary learning experts, it is known that the smart stair learning media in the developed length unit measurement material has a percentage of 95.8% with a very valid category so that learning media can be used in the learning process.

CONCLUSION

The conclusion of the development of smart stairs learning media on the unit length measurement material integrated with problem based learning using the ASSURE model with three stages starting from analyze learner characteristic, state objectives, select methods, media and materials obtained the results of the validity of material experts (91.6%), media experts (90%), and elementary learning experts (95.8%) so that researchers can find out that smart stairs media is valid to be developed and can be used in the learning process .

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