



STEAM-Culture Based Teaching Materials on Cube and Block Building Materials

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Abstract. This study aims to develop learning tools in the form of STEAM-Culture-based teaching materials to prepare students for the 21st century. The research method used is the ADDIE research method, namely Analysis, Design, Development, Implementation, and Evaluation. This research was conducted at SMPN 12 Madiun on the material of building blocks and cubes for class VIII. The results of this study are STEAM-Culture-based teaching materials on the material of building cubes and blocks are declared valid with a percentage of 81% validity.

Keywords: Teaching materials · STEAM-Culture · Cubes and Blocks

1 Introduction

Currently the world is in the 21st century, where knowledge and skills in all fields are indispensable, especially in education. Education has an important position in the development and progress of a nation. Based on the Law of the Republic of Indonesia No. 20 of 2003 concerning the National Education System article 1, states that education is a conscious and planned effort to provide a learning atmosphere and learning process so that students can develop their potential actively to have religious spiritual strength, intelligence, self-control, noble character, and skills. Needed for themselves, society, and nation and state. Education that emphasizes the ability to think critically, communicate, collaborate and master technology is a feature of education in the 21st century [1]. Meanwhile, according to ways of thinking that include thinking, creative, critical thinking, communicating and collaborating are skills that students must have in 21st century learning [2].

Mathematics is a compulsory subject that must be taught in schools from (SD) to (SMA). Mathematics is a general science that plays an important role in the development of human thinking abilities and as the basis for current technological developments [3]. In line with that mathematics is a basic science that has an important role in science and technology [4]. So that through learning mathematics, 21st century skills should be instilled in students since school, this is done to equip students to be able to compete in the 21st century.

According to the Program for International Student Assessment or PISA in 2018, Indonesia was ranked 73rd out of 78 countries, and received a reading score of 371, a

math score of 379, and a science score of 396, with an OECD average of 487, 489, and 483 in each aspect [5]. This shows that the average mathematical ability of students in Indonesia is relatively low, even though mathematics is one of the compulsory subjects that plays an important role in preparing students for the 21st century.

The learning conditions at SMPN 12 Madiun based on the results of interviews and observations made with mathematics teaching teachers showed that mathematics is a subject that is not liked by students, this is reinforced by student statements that say mathematics is a difficult subject. In addition, student learning outcomes show that the average student scores below the KKM. This is caused by the lack of understanding of students about the material being taught, because they feel learning mathematics is not fun and difficult to reflect in real life. In addition to these facts, one of the factors that influence the learning process is the readiness of the teacher as outlined in the learning tools, namely teaching materials. Where there is no use of teaching materials that direct students to develop the skills needed in the 21st century. Teachers only use module books and packages as learning resources.

Teaching materials are everything that contains subject matter that is made systematic and used by teachers during the learning process [6]. Meanwhile, the notion of teaching materials is a set of theories, facts, and principles, as well as procedures designed to facilitate teaching [7]. Teaching materials have an important role in learning, namely as a guide for teachers and students to carry out the learning process. In addition, the function of teaching materials is that they can build effective learning communication between teachers and students, and can help students master the competencies that must be possessed [8]. For this reason, teaching materials are needed that are able to deliver students to face the 21st century.

The STEAM approach is one approach that integrates the 21st century. The STEAM approach itself is a learning approach that develops the skills needed in the 21st century [2]. STEAM itself is an abbreviation of Science or science, Technology or technology, Engineering or Engineering, Art or Art and Mathematics or Mathematics. STEAM approach aims to train students to be able to adapt to the unexpected demands of the times and is expected to be able to grow students' problem solving skills [9]. One example of STEAM learning in mathematics is the learning of spatial material, which can be done by using mathematical software technology with easier and more interesting building techniques [10]. In addition, you can also add color as an element of art.

Along with the rapid development in knowledge and technology in the 21st century, of course, on the other hand, it can pose a threat to the nation's culture. Therefore, in addition to applying the STEAM approach in learning mathematics, it also raises elements of the nation's culture as an effort to introduce culture to students and keep culture from being forgotten by the nation itself. Local culture is part of the identity of the nation whose existence is maintained by the local community [10]. Meanwhile, according to [11] local culture are customs that are inherent in the soul of the local community. Indonesia is a country that has a variety of cultures, but most students are not familiar with the surrounding culture, even though the culture around students can help students understand learning in schools, including learning mathematics. Therefore, the STEAM approach in collaboration with culture is believed to be a good innovation if it is included in mathematics teaching materials, this besides being able to improve

students' 21st century skills, it can also provide insight and cultural introduction to students.

Based on the explanation of the problem, it is felt that it is necessary to develop mathematics teaching materials that are able to prepare students to master 21st century skills. Through this research, STEAM-Culture integrated mathematics teaching materials will be developed on the material of building cubes and blocks.

2 Method

The type of research used in this research is research development research and development (R&D). The Research and Development research method commonly called R&D is a research method or process used to validate and develop products [12]. While the research model used is ADDIE or Analysis, Design, Development, Implementation, and Evaluation. The purpose of this research is to create and develop a product in the form of STEAM-Culture-based teaching materials for class VIII students at SMPN 12 Madiun which is made to understand the material for building flat sides of cubes and blocks. The population in this study was class VIII SMPN 12 Madiun. While the samples taken were students of class VIII F SMPN 12 Madiun. This research method has three stages, each of which is to test product validity, product practicality and product effectiveness. However, in this study only the first 3 stages were taken which aimed to test the validity of the product in the form of teaching materials. There are 3 stages that will be carried out in this research, which are as follows (1) analysis. This stage is the initial stage which aims to analyze the potential and problems related to the developed teaching materials, ongoing learning activities, and the 21st century abilities of SMPN 12 Madiun students, (2) design. The second stage is the design which consists of the preparation of research instruments and the initial design of teaching materials. The research instruments compiled include instrument validation sheets, teaching material validation sheets, student response questionnaire sheets in the form of questionnaires, and test sheets, (3) development. The third stage is the development stage which includes the product manufacturing process and product assessment in the form of validation of the resulting product design. Where the assessment shows the level of validity of the resulting product and is used as a reference for product improvement.

3 Result and Discussion

This study aims to develop teaching materials that are integrated with STEAM-Culture in order to develop students' abilities to face the 21st century at SMPN 12 Madiun. The culture used in this study is the culture in Madiun, for example the Sewulan Great Mosque and the Taman Ancient Tomb. By using the 3 initial stages in the ADDIE research model, which will be explained as follows:

1. Analysis Stage

Based on the results of the interviews, information was obtained that the learning resources used at SMPN 12 Madiun were still limited, where teachers only used the 2013 curriculum bse package books from the school. Where in it there is no STEAM-Culture

approach that is able to improve students' abilities to face the 21st century. In addition, information is obtained that the average student learning outcomes are still low, this is caused by students not understanding the material presented by the teacher because students have not been able to construct the material. Build cube and block spaces in real life.

2. Design Stage

At the design or planning stage in this research, it includes the preparation of instruments in the form of validation sheets and preparation of the initial design of teaching materials.

a) Preparation of Teaching Material Validation Sheet.

The teaching material validation sheet consists of 13 statement items that contain 4 statements of content aspects, constructs aspects which contain 7 statements, and language aspects which contain 2 statements. With a choice of scoring scores 5: very good, 4: good, score 3: good enough, score 2: not good, and score 1: very bad. At the end of the assessment of the validation sheet, the validator can provide input and suggestions that can be an evaluation of improvements to the developed learning device.

b) Initial Design of Teaching Materi

The initial design of teaching materials on STEAM and culture integrated learning tools to improve students' 4C abilities on the material of building cubes and blocks in the form of modules with front covers, introductions, table of contents, learning information which includes basic competencies, indicators of competency achievement and learning objectives. Then there are instructions for using teaching materials, concept maps, and cube and block materials. In the cube material there is an introduction to the culture of the Taman Ancient Tomb, then on the beam material there is an introduction to the culture of the Sewula Great Mosque.

3. Development Stage

The development stage in this study consisted of the production of teaching materials and validation of STEAM-Culture-based teaching materials. The stages of development in this research are as follows:

a. The results of the STEAM-Culture-Based Teaching Materials used in this study can be seen in Fig. 1, 2 and 3:

Figure 1 shows that there is a picture of Indonesian cultural diversity in the form of material and there is an overview of what is described in the teaching materials.

Figure 2 explains what a cube is and its elements. At the appreciation of the cube material, a picture of one of the cultural sites in Madiun is given, namely the Sewulan Great Mosque which has a cube-shaped part.

Figure 3 explains what a block is and its elements. In the reception of the beam matri, a picture of one of the cultural heritages in Madiun is given, namely the Ancient Garden Gate, where the entrance gate has a section in the form of a beam.



Fig. 1. Teaching Material cover

MATERI BANGUN RUANG SISI DATAR

Berdasarkan tujuan pembelajaran di atas maka kali ini kita akan membahas mengenai rangkuman materi kelas 8 semester genap. Kita akan belajar mengenai bangun ruang sisi datar, bangun ruang ada banyak macamnya. Mereka bisa dikelompokkan dalam dua golongan besar yaitu bangun ruang sisi datar dan bangun ruang sisi lengkung. Bangun ruang sisi lengkung seperti bola, kerucut, tabung, sedangkan untuk bangun ruang sisi datar akan kita pelajari berikut.

Bangun Ruang Sisi Datar
 Apa itu bangun ruang sisi datar? Pernahkan kalian melihat benda-benda di bawah ini?






Nah benda-benda di atas adalah beberapa contoh bangun ruang sisi datar. Bangun ruang sisi datar adalah bangun tiga dimensi yang memiliki volume dan terdiri dari sisi-sisi yang berbentuk datar (tidak lengkung).

Ada beberapa macam bangun ruang sisi datar dari mulai yang paling sederhana seperti kubus dan balok limas sampai yang sangat kompleks seperti limas segi banyak atau bangun yang menyerupai kristal. Namun demikian kali ini kita akan membahas spesifik tentang bangun ruang kubus, balok.

A. KUBUS

Masjid Agung Sewulan
 Masjid Agung Sewulan adalah salah satu situs budaya yang ada di Madiun. Masjid ini terletak di Desa Sewulan RT 07/RW 02 Kecamatan Dagangan Kabupaten Madiun. Masjid ini didirikan pada tahun 1714. Pada gapura masuk masjid dapat kita lihat terdapat bagian yang berbentuk kubus.



Fig. 2. Material cube



Fig. 3. Block material

The teaching materials developed in this study consisted of 13 pages starting from the cover page to the last page.

b. Validation of STEAM-Culture Teaching Materials

Validation on teaching materials has the aim of knowing whether STEAM-Culture-based teaching materials are really valid so that the research carried out is valid as well. The learning device validators appointed in this study consisted of three experts, namely (1) Validator I is a lecturer at the Mathematics Education Study Program, PGRI Madiun University as an expert in learning tools, (2) Validators 2 and 3 are teachers of mathematics at SMPN 12 Madiun.

The results of the validation of teaching materials show that the results of the validation of STEAM-Culture-based teaching materials have a validity of 81% which is included in the category of quite valid or can be used with minor revisions which can be seen in the following table:

c. Revision of Teaching Materials

Based on the results of the validation of STEAM-Culture-based teaching materials, minor revisions need to be made, namely the need to add STEAM-Culture material which is followed up by adding ecoprint batik introduction material and adding practice questions that are useful as student evaluations.

Table 1. Teaching Material Validation Results

Validation Results	validator 1	validator 2	validator 3
Total Scores Obtained	50	53	54
Maximum Score	65	65	65
Presentation	77%	82%	83%
Combined Presentation	81%		

4 Conclusion

Based on the results and discussion, the feasibility of STEAM-Culture-based teaching materials on cube and cuboid space building materials obtained a valid percentage of 81% which is included in the fairly valid category according to the validity criteria where the teaching materials are declared valid if the percentage of validity exceeds 70.1%

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