



Development of STEM-Based "Sports Mask" Worksheets for Class V Elementary School Students

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Abstract. The spread of the virus occurs in various ways, one of which is through droplets. The use of masks is needed at any time, one of which is when exercising, because development in this situation makes movement and breathing rules better, especially controlling emotions, breathing, and movement. It is necessary to develop worksheets properly for fifth grade students of STEM-based elementary schools to overcome these problems, because class V has the best motor than the others. This study aims to produce STEM-based sports mask worksheets. The re-search method used is Education Design Research (EDR). The product developed is a STEM-based student worksheet. The results of the expert test on science material, learning media and psychology obtained 88.33% with valid qualifications and did not require revision. This LKS can be used by fifth grade elementary school students with the prerequisites of knowing the human respiratory system, knowing 2D flat shapes, air filtration systems, and capillary action.

Keywords: STEM, based elementary, masks.

1 Introduction

The dynamics of the world of basic education have undergone significant changes. This is affected by the rapid development of information technology. Changes in community culture and new paradigms in all aspects. Especially elementary school students must have 21st century skills, namely how to think, how to work, tools to work, and live in the world. This ability must be trained continuously in developing student competencies.

STEM-based learning is one of the potential alternatives to be used to build 21st century skills [1]. STEM learning in Indonesia is something that is not new, but is rarely implemented. The existence of student books and teacher books according to the 2013 curriculum issued by the Indonesian government makes teachers reluctant to develop learning. In fact, STEM is an integrated learning between science, technology, engineering, and mathematics to develop students' creativity through the process of solving problems in everyday life [2]. STEM can be applied in learning in elementary schools, especially at the high grade level.

In the context of basic education, STEM education aims to develop students who are STEM literate: 1) Have the knowledge, attitudes, and skills to identify questions and problems in their life situations, explain natural phenomena, design, and draw evidence-based conclusions about issues related to STEM; 2) Understand the special

characteristics of STEM disciplines as human-initiated forms of knowledge, investigation, and design; 3) Have an awareness of how STEM disciplines shape the material, intellectual and cultural environment, 4) Have a desire to be involved in the study of STEM-related issues (e.g. energy efficiency, environmental quality, limited natural resources) as constructive, caring citizens and reflective by using ideas of science, technology, engineering, and mathematics [3]. This application will have a good impact on elementary school students both psychologically and physically. Students trained in science must be developed through educational levels so that as adults, they can make decisions related to various kinds of issues and can overcome these is-sues scientifically [4].

One solution to the problem that can be done is to help reduce and prevent the Covid-19 pan-demic. The positive side of the Covid-19 pandemic exercise is carried out with the aim of maintaining body immunity [5]. If you are in good health, you will avoid unwanted diseases. Physical activity must still be done because it has many benefits for our bodies even during a pandemic [6]. This concern has led people to leave their homes to exercise, while maintaining their distance, using masks, and washing their hands. Sports activities certainly have a high risk of contracting them when carried out outside the home.

One way of spreading the Covid-19 virus is by means of droplets. The use of masks is needed when exercising. According to preliminary studies, many people are not comfortable using masks when exercising. Several reasons emerged, such as 1) wet masks were uncomfortable to wear; 2) shortness of breath; and 3) not accustomed to wearing masks. On this basis, a solution is needed. Elementary school students can solve these problems using STEM, where at grade V there is the theme "Clean Air for Health" in the 2013 curriculum. STEM learning is relevant to the 2013 curriculum such as Thematic learning [7]. STEM-based learning enhancement will form the character of students who are able to recognize a concept or knowledge (science) and apply that knowledge with the skills (technology) they master to create or design a method (engineering) with analysis and based on the calculation of mathematical data (math) in order to find a solution to solving a problem so that hu-man work becomes easier [8].

Learning development is needed to solve these problems. Through curriculum integration, it will provide a learning experience that links students' initial knowledge with real-world contexts, through integrating meaningful content in real-life problem-solving settings [9]. It is necessary to develop STEM-based worksheets to solve these problems. STEM-based worksheets provide learning services as a guide for students in group study work, interaction with friends in manipulating types of objects, asking questions, focusing on observation, collecting data and trying to explain natural phenomena [10]. The importance of developing STEM-based “sports mask” worksheets for grade V elementary school students.

2 Methodology

This research uses development research. Products developed relate to education, then using Education Design Research (EDR). The product developed is a STEM-based

student worksheet. The development steps 1) Analysis and Exploration; 2) Design and Construction; 3) Evaluation and Reflection [11].

The Analysis and Exploration stage is carried out by conducting a preliminary study by searching for literature, namely references and research journals. At the Design and Construction stage, namely making a storyboard related to the contents of STEM-based Sports Mask Worksheets. In addition, the Evaluation and Reflection stage was carried out by tests of material experts, learning media, and psychology. The results at this stage will be used as a reflection material to revise the sports mask worksheets product. The results of expert validation are limited to the form of a Likert scale, this is to make it easier to determine the revised category of the product. The following is a table of the Likert scale used.

Table 1. Description Likert scale.

Scale	Achievement Level	Qualifications	Description
5	90% - 100%	Very valid	No need to revise
4	75% - 89%	Valid	No need to revise
3	65% - 74%	Fairly valid	Revised
2	55% - 64%	Less valid	Revised
1	0 - 54%	Invalid	Revised

3 Results

The development of this L Sports Mask product begins with conducting literature studies by reading books and research journals. The results of the literature study are:

1. interested in the theme "Clean Air for Health";
2. help the government prevent the spread of Covid-19; and
3. increasing student awareness to prevent the spread of Covid-19.

In addition, it explores the Basic Competencies of the 2013 Curriculum for grade V Elementary School students, namely:

1. Basic Science Competence (grade V)
2. Describe the respiratory organs and their functions in animals and humans, as well as how to maintain the health of the human respiratory organs
3. Making a simple model of the human respiratory organs
4. Basic Mathematics Competencies (grade IV)
5. Explain and determine the angular size of a flat shape in standard units using a protractor
6. Measuring the angle of a shape in standard units with using a protractor

Combining class V material for science and class IV material for mathematics. This is because in STEM, students must master the prerequisite knowledge so that they do not experience difficulties in implementing STEM.

The design of the sports mask worksheets is done by making a storyboard. The contents of this storyboard are the initial designs used to develop the product. The material used in the preparation of storyboards comes from the development of the 2013

curriculum. The results of developing indicators and learning objectives are manifested in the form of learning activities.

The Sports Mask worksheets storyboard contains the activities in the worksheets that will be carried out, consisting of Discussion on Good Air for Health, Observation of Sports People, Designing Sports Masks, Discussion of Sports Mask Materials, Determining the Costs of Making Sports Masks, Making Sports Masks, 1st Trial Sports Masks, Reflection and Revision of the Results of the 1st Trial, 2nd Trial of Sports Masks, Reflection and Revision of the Results of the 1st Trial, Conducting Sports Masks Expo / Exhibition, and Compiling the Final Report of Sports Masks.

The preparation of the worksheet product is in accordance with the storyboard that has been made, besides that it still considers the depth and breadth of the material, time, cost, student ability, as well as the availability of raw materials in the surrounding environment.

KEGIATAN 1
Observasi Orang Berolahraga

A. Tujuan Kegiatan
Siswa melakukan kegiatan pengamatan olahraga pada sekelompoknya, yaitu mengamati aktivitas olahraga model dalam berolahraga lari, dan bersepeda. Jawaban kelompok lain mengenai proses olahraga.

B. Alat dan Bahan

1. Stopwatch
2. Masker lapang
3. Sepeda
4. Alat dan bahan.

C. Kegiatan

1. Kegiatan ini dilaksanakan secara berkelompok sesuai dengan kegiatan 1
2. Siswa melakukan kegiatan di bawah ini

No	Kegiatan	Jumlah Waktu / Menit	Wawancara dengan pelari/pe sepedas (saat berolahraga berolahraga menggunakan masker)
1	Lari selama 10 menit tanpa menggunakan masker		
2	Lari selama 10 menit menggunakan masker		
3	Bersepeda selama 15 menit tanpa menggunakan masker		
4	Bersepeda selama 15 menggunakan masker		
5	Kesimpulan Observasi		

KEGIATAN 2
Mendesain Masker Olahraga

A. Tujuan Kegiatan
Siswa mendesain masker olahraga dengan menggunakan gambar yang pernah siswa lihat melalui televisi yang menarik. Desain yang dibuat dalam 1 bentuk yaitu bentuk desain, penemuan, dan perancangan kegiatan.

B. Alat dan Bahan

- a. Potensi siswa
- b. Alat tulis

C. Kegiatan

1. Kegiatan ini dilaksanakan secara berkelompok sesuai dengan kegiatan 1
2. Kelompok mendesain langsung pada model gambar di bawah ini!

Desain Masker Laki-Laki Tanpa Mata Depan

Fig. 1. Worksheet

The results of the validation on science material experts, instructional media, and psychology are used as material for reflection to revise the product being carried out. The suggestions from social studies material experts are: 1) it is necessary to add a mask design for various genders, such as women who wear a headscarf; 2) The mask testing phase needs to be completed with measuring instruments, so that students can find out its effectiveness; and 3) the final report on stem activities needs to be added with attachments, so that student activities can be observed properly. The instructional media experts provide the following suggestions: 1) Complete the mask image mall on the side face, not only the front face; 2) there is no indication of using work-sheets yet; 3) complete the worksheets with the cover. Psychologists advise that this worksheet has components that are difficult to do, there should be instructions on how to do it.

Table 2. Expert table

Expert	Percentage (%)	Qualification
Sains Expert	90	Very valid
Instructional Media Expert	85	Valid
Psychology	90	Very valid

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4 Discussion

Obtaining validation carried out on material experts in science, learning media and psychology as follows.

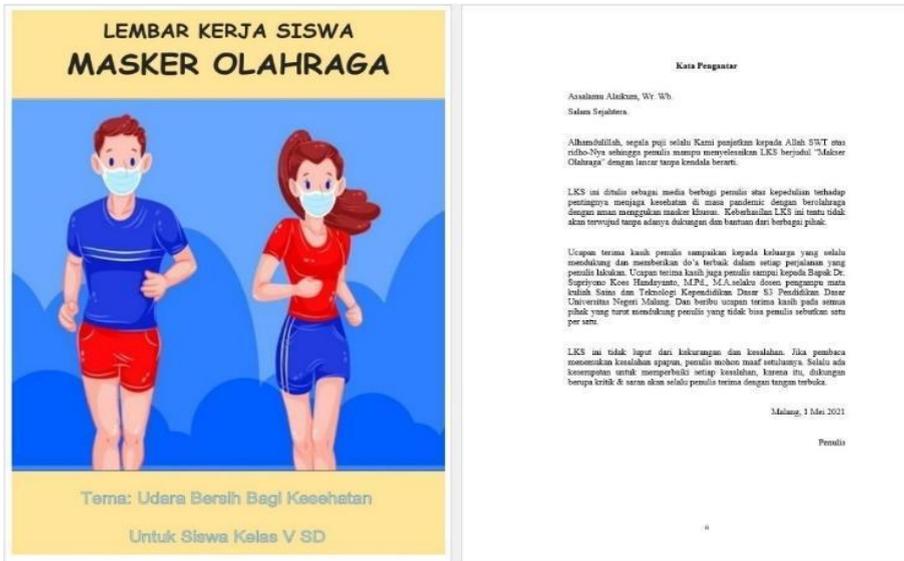


Fig. 2. Revise worksheets

The results of the validation by science material experts get a score of 90%, which means that the STEM used is in accordance with its purpose. STEM education is a top priority for solving global issues and problems facing the world today, for example: (1) global warming; (2) air and water pollution; (3) clean drinking water, and food safety [12]. In STEM learning, students are required to solve real-world problems and be involved from ill-defined tasks to well-defined outcomes through teamwork [13].

In the validation, media experts get a score of 85%, including in the valid category. This worksheets media can be used in learning, fulfilling the characteristics of the worksheets which are in accordance with the learning stages. The contents of the worksheets begin with problems, discussions, and solutions, so that the students' knowledge received will be intact. At the basic education level, students are concerned

with basic STEM knowledge and relate their knowledge to everyday life situations through investigative and exploratory activities [4].

The results of the psychologist's validation got a score of 90% with a very valid category. The worksheets that are made can solve problems, because they are project-based. On the basis of project-based learning can help students in the process of constructing knowledge individually according to the capacity of each student [14]. Collaborative risk-taking and creativity, meaning that learners use skills and learning processes in science, technology, engineering, and mathematics in thinking and solving problems [12]. The existence of a product that is solved by the problem can increase students' confidence when in society

The development of the STEM-based Sports Mask Worksheet can be used in learning in Class V Elementary School Students. This is because the goals of STEM education for students are learning and innovation skills which include critical thinking and being able to solve problems, be creative and innovative, as well as being able to communicate and collaborate, skilled at using media, technology, information, and communication (ICT) [2]. Students can carry out STEM learning according to group abilities, even though the work done is not quite right, it can be reflected and revised in learning.

Based on the tabulation of the validation results, it can be seen that the acquisition of STEM-based sports mask worksheets is feasible and in accordance with the theory. The average validation results get 88.33% with valid qualifications and do not need revision. However, the advice given by experts has made improvements, so that the product is of higher quality. The Stem Worksheet was also effective in improving students of creative thinking skills [15]. Schools need to provide recommendations to teachers to gain knowledge, implement and develop STEM-based learning in schools, facilitate the implementation process and help develop finding ways to train 21st century skills through STEM learning [8].

5 Conclusion

The development of STEM-based sports mask worksheets can be used. The results of the expert test on science materials, instructional media and psychology obtained 88.33% with valid qualifications and did not re-quire revision. These worksheets can be used by grade V students in elementary school with the prerequisites of knowing the human respiratory system, knowing 2D flat shapes, air filtration systems, and capillary power..

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