

Integration of STEAM and Digital Teaching Materials: A Prototype of a Science Learning Model for Elementary School Students

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Abstract

This research aims to develop a STEAM (Science, Technology, Engineering, Art, and Mathematics) learning model based on digital science teaching materials to improve students' creativity. The research approach used is Research and Development (R&D) with a development model that includes needs analysis, design, development, validation, implementation, and evaluation. The research subjects were students at the secondary education level who were involved in limited trials and extensive trials. The results showed that the STEAM-based digital teaching materials developed were in accordance with the principles of innovative learning. The implementation of the model in the classroom shows an increase in learner creativity, which is reflected in their increased ability to think critically, solve problems, and generate new ideas in science learning. Thus, the development of a STEAM learning model based on digital teaching materials can be an alternative learning strategy in improving students' creativity. Recommendations from this study are the integration of learning models into the school curriculum as well as training for teachers in the application of this model for more optimal results.

Keywords: STEAM, teaching materials, science.

1. Introduction

Science has become one of the indicators of the progress of a nation's civilization, especially for people who consider science as a fundamental aspect of life. This statement can be justified if we look at countries with high dependence on science that are proven to be more advanced and influential. In contrast, in countries that have not made science a primary need, people's perspectives tend to be different, which ultimately affects their lifestyle. (Khotimah, 2014). In addition, science is basically one of the interesting sciences to be studied and developed because science is very close to human life in addition to the social sciences that study human life as social beings. In line with the current science learning curriculum that learning is emphasized on aspects of developing students' problem-solving skills that emphasize process-based learning to get a product.

Science learning is so important that it is emphasized as a core subject to make students more critical so that they can understand the world and make informed decisions. One of the problems in basic education is that subjects are usually taught independently of each other, whereas the best way for students to learn and understand scientific concepts in depth is through real-world applications (Drake, 2012). Unfortunately, based on the latest PISA "Program for International Student Assessment" data, Indonesia ranks 70 out of 78 countries in the SCIENCE rankings. This is certainly an important thing for Indonesia to find ways to strengthen education in natural science and mathematics.

Science learning will be interesting if it uses learning that suits the needs and developments of the current era. One of the efforts to make learning more interesting by using a learning model that is given problems in everyday life using the STEAM (Science, Technology, Engineering, Art and Mathematic) learning model. The STEAM learning model requires students to be able to solve problems, make updates (innovation), find/design new things, understand themselves, do logical thinking and master technology. In the learning process, students are focused on the real world and authentic problems so that students learn to reflect on the problem-solving process. STEAM learning makes students have deep insights, are dynamic and creative, so as to create superior generations. Thus the STEAM learning model will make it easier for teachers to develop students' abilities so that students will gain new knowledge from

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learning. STEAM learning can also encourage active student involvement in Science and Mathematics classes with a variety of interdisciplinary and project- or problem-based approaches (Lockwood, 2023). The STEAM approach when applied and designed in appropriate learning students are able to solve real-world problems (Buckner & Boyd, 2015).

The STEAM approach is one of the most popular approaches in improving student creativity and problem-solving skills (Perignat E & Buonincontro J, 2018). The STEAM approach as an integrated approach can be supported using media during learning (Stohlmann, M., T. J. Moore & G. H. Roehrig, 2012). Learning media that can be used are teaching materials. Teaching materials that have been made can develop students' thinking skills, namely creative thinking. Research (Kurnia et al., 2016) and (Darwanto, 2017) that teaching materials can be used to foster creative thinking. Teaching materials that are made meet the competencies of the material being taught. Teaching materials allow students to learn a competency or KD coherently and systematically so that they are accumulatively able to master all competencies as a whole and integrated (Depdiknas, 2008). Teaching materials are used as an interaction between teachers and students. As stated by Pannen that teaching materials are systematically arranged which are used by teachers and students in the learning process (Prastowo, 2015).

Based on the results of observations that have been carried out in three schools in Barru sub-district, namely at SD Negeri 1 Barru, SD 33 Barru, SD Mallawa Barru in the even semester of the 2022-2023 school year, several problems were found regarding low student learning creativity. Low creativity can be seen from students who are unable to relate 4 concepts, issue ideas or ideas related to the material they have obtained, so that they cannot foster independent learners in learning and creative in dealing with a problem in accordance with the objectives in learning. Another problem that researchers find related to student learning creativity is that during the learning process in the classroom, students rarely ask questions if there is material that they do not understand and are less able to express their opinions when learning. These problems are a lack of good communication in the learning process. In addition, when giving assignments many students complain and lack of desire in terms of finding and finding out about material in science lessons. As a result of this situation, students do not follow science lessons effectively and do not even make science lessons meaningful after the teacher delivers the material. This low creativity can be seen when in the process of learning science takes place only being a recipient of what the teacher says and lack of creativity.

Based on the results of interviews with several fifth grade teachers in three schools, the author obtained data, they said that the teacher complained that when students answered the questions given by the teacher, their answers were very short. Students are not able to analyze the questions given by the teacher. According to them, the learning provided at this time has not honed students' creativity skills. This happens because they still use classical learning such as lectures in learning, very rarely using interactive teaching materials or multimedia as additional teaching materials. Then another thing obtained from the results of teacher interviews stated that in the learning process, they had not applied digital teaching materials with an approach by integrating learning models, because teachers still had difficulty in accessing teaching materials. The teaching materials presented have not been able to develop the creative thinking ability of students. Therefore, teachers really need and need digital teaching materials that are in accordance with learning materials.

Another problem is caused by the use of teaching materials that are less varied. The use of teaching materials that are less varied in delivering science learning materials makes students only listen to what is conveyed by the teacher, and can inhibit the creativity that exists in students. This is in accordance with the opinion (Awang, 2015) which says that: "So far, science education has been identified as learning that is difficult for students to understand in the classroom. Both strategies, methods, and learning techniques rely more on a monotonous teacher-based approach, and minimize students" (p. 4).

These problems can be overcome by using learning teaching materials that are expected to attract students' attention and can stimulate learning creativity during the learning process. One of the teaching materials that researchers will use is by utilizing the use of digital-based teaching materials in learning. Digital teaching materials are components of learning materials presented in digital or electronic form, which can be accessed via computer devices or mobile devices. Digital materials can be in the form of text, images, sound, video, animation, or a combination of several of these media. Digital teaching materials can be used for various purposes, such as to facilitate distance learning, enrich the learning experience in the classroom, increase student engagement, and improve the efficiency of the learning process. In some cases, digital materials can also be used to replace textbooks or other conventional teaching materials.

Based on the background mentioned above, the problem formulation in this study is how is the design of the Development of the cSTEAMc Learning Model (Science, Technology, Engineering, Art and Mathematic) based on Digital IQA Teaching Materials to Increase Learner Creativity?

2. Research Method and Materials

The approach in this study uses quantitative to improve the quality of a product or object produced and test the effectiveness of the product. Development research is a process or steps to develop a new product or improve existing products (Winarni, 2023). The R&D method can also increase the value of any changes that may occur in the field of education, both in terms of processes, products, and results in the form of process skills-based science teaching materials to increase student creativity.

This research is a Reasearch and Development or R&D study that develops a STEAM learning model based on digital science teaching materials to increase the creativity of students in elementary schools. In the development process using research that is a needs analysis. Therefore, this research leads to produce products in the form of Learning Models that contain teaching materials, LKPD and Assessments.

The subjects in this study were students and teachers in grade V SDN 1 Barru, SDN 33 Barru and SDN 25 Barru. While the products in this study are model books, teaching materials, LKPD and assessmentsThe learning device development procedure used in this study refers to the 4-D model developed by Thiagarajan, Dorothy S. Semmell, and Melvyn I. Semmell. The device development procedure starts from the stages of defining (define), designing (design), developing (develop), and disseminating (disseminate).

The four activities can be explained as follows:

a. Defining Stage

This stage aims to establish and define the learning requirements of grade V science material by analyzing the objectives and limitations of the material. The activities in this stage are beginning-end analysis, learner analysis, material analysis, task analysis and specification of learning objectives.

In detail, each of these activities can be described as follows:

- Beginning-End Analysis

The beginning-end analysis aims to raise and identify the basic problems teachers face in improving student learning outcomes, and then to look for effective and efficient alternative solutions. At this stage, a review of the learning outcomes of class V is carried out to choose the right approach, model and learning method that is relevant to the material and class conditions so that a description of a suitable learning pattern is obtained. Furthermore, by observing the teaching materials used in class VI, it was decided that science teaching materials need to be developed. In order to identify the basic problems, discussions were held with the headmaster and the fifth grade teacher of SDN 1 Barru. Based on the identified basic problems, the development of digital teaching materials for class V science was started.

- Learner Analysis

At this stage of the activity is a review of the background knowledge of students, the use of everyday language at school, and the cognitive development and learning styles of students who are used as a frame of reference in preparing the design of digital teaching materials that are in accordance with the characteristics of grade V elementary school students.

- Material Analysis

Material analysis aims to identify, detail, and systematically arrange the main materials that students learn, then the material is arranged hierarchically by the researcher and continues to coordinate with the fifth grade teacher of SDN 1 Barru.

- Task Analysis Process Assessment and Outcome Assessment

Task analysis is a collection of procedures to determine the content of material in learning. Task analysis is carried out to detail the content of the teaching material in outline and design the tasks of students during the process and after learning. Based on material analysis which includes science material in grade V SD.

- Specification of Learning Objectives

The specification of learning objectives aims to formulate learning objectives, based on material analysis adjusted to learning outcomes. The details of these learning objectives are the basis for the preparation of digital science teaching materials for grade V SD.

b. Design Stage

The purpose of this stage is to prepare an initial draft of the STEAM learning model based on digital science teaching materials. Activities at this stage are: 1) Preparation of teaching materials, in this activity compiling a systematic teaching material to be developed which is tailored to the needs and components of grade V science material, 2) Preparation of tests, tests are prepared based on the achievement of learning objectives. This test is a measuring tool for changes in behavior in students during the process and after learning activities, 2) Selection, selection of the right media to present grade V science material tailored to material analysis, task analysis, and facilities available at school and the characteristics of students, 3) Selection of formats, in the selection of formats carried out by reviewing several existing formats both teaching material formats, LKPD formats, and process assessment instrument formats, 4) Design of STEAM learning models based on digital science teaching materials made are teaching materials, learning media, LKPD, and assessment instruments.

c. Development Stage

The purpose of this stage is to produce a draft of digital science teaching materials that have been revised based on expert input and data obtained from trial results at SDN 1 Barru. Activities at this stage are:

- Expert Assessment

After designing the digital science teaching materials, the initial product was assessed by two experts, which aims to see the feasibility of the initial product and to obtain suggestions for improvement. The data from the expert assessment is then analyzed and further revised based on the suggestions/input obtained. After making improvements to the product based on suggestions/input from experts and declared valid, it resulted in a product called draft II.

Expert assessment is a technique for obtaining suggestions for improvement as well as an assessment of teaching materials that have been produced at the design stage.

- Readability Trial

The readability test was carried out to obtain input on whether all teaching materials could be clearly read and understood so that they could be used in the class that was the subject of the study. Teaching materials that have met the criteria for readability are called draft I.

- Field Trial

In the field trial, draft I which has met the criteria of validity and readability was then tested in the field. The trial was conducted at SDN 1 Barru. The purpose of holding this field trial is to determine the quality of the product developed in terms of practicality and effectiveness. In addition, after the field trial for the instrument of student creativity results developed, the T test was continued. Draft II which has been tested and meets practical and effective criteria is the final draft.

d. Disseminate Stage

This stage is the final draft deployment stage by sharing the STEAM learning model based on digital science teaching materials that have been developed with elementary school teachers. In addition, it will also share teaching materials that have been developed online on the researcher's personal blog to make it easier for anyone who needs and wants to access the learning tools that have been developed by researchers.

Data collection techniques in teaching material development research use two types, namely interviews, questionnaires (questionnaires) and observations. Data collection techniques in teaching material development research use two types, namely interviews, questionnaires (questionnaires) and observations.

- Observation Methods

The observation method is carried out by filling out an observation sheet to directly observe the state of students' activeness in the learning process to obtain the data needed in the research. As well as to find out the supporters of

learning activities and the science learning process in grade V before and after using digital science teaching materials that have been developed in research elementary schools

- Interview

Interviews are used as a data collection technique if the researcher will conduct a preliminary study to find the problems that must be researched and also if the researcher will know things from the respondents in more depth and the number of respondents is small/small. Interviews conducted to find out the initial data in the research and the information obtained are used as input to develop teaching materials.

- Questionnaire

Questionnaire is a data collection technique that is carried out by giving a set of questions or written statements to respondents to answer. Questionnaires are used during the evaluation and trial of teaching materials. The evaluation of this teaching material is carried out by media expert validators, material expert validators, and religious experts. Meanwhile, the trial of teaching materials provides a questionnaire for students.

Data analysis is a process of processing and interpreting data with its functions so that it has a clear meaning and meaning according to the type of data collected. The analysis techniques in the research carried out in the study are descriptive analysis and inferential analysis. Descriptive analysis in this study is a method used to describe or summarize the data that has been collected. The main purpose of this analysis is to provide an overview of a data set without drawing further conclusions. Descriptive analysis often uses statistical measures such as mean (mean), median, standard deviation. Meanwhile, inferential analysis is used to make conclusions or inferences of research subjects based on data from samples.

3. Results and Discussions

In the section, it will be discussed about the process of developing a STEAM learning model based on Digital Science Teaching Materials to Increase Student Creativity (BADIK).

In fact, the research and development fund produced several products in the form of a STEAM learning model based on digital science teaching materials to increase student creativity (BADIK). Digital teaching materials for science lessons are digital learning applications and can be used by users, especially teachers and students in the science learning process in grade V of elementary school. The development of a STEAM Learning Model Based on Digital Science Teaching Materials was produced through several stages based on the Four-D device development model proposed by Sivasailam Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel in 1974. This approach includes four main stages, namely Define, Design, Develop, and Disseminate, which are often adapted into 4-D models in Indonesian as the stages of definition, design, development, and deployment. Based on the problems that have been described previously, the results of the research are described as follows:

The activities carried out at each stage of development can be explained as follows:

3.1. Define

This stage aims to define and define various development requirements. In some models, this stage is known as a needs analysis. Each product requires a different approach to analysis. In general, activities in the definition stage include analyzing development needs, determining product requirements according to user needs, and selecting the right research and development (R&D) model for the product development process.

According to Mulyatiningsih (2012), in the development of teaching materials such as teaching materials, LKPD, and assessment instruments, the definition stage is carried out through several steps: 1) Curriculum analysis, 2) Analysis of student characteristics, and 3) Material analysis. Based on this, the research begins by conducting an initial investigation to understand the initial condition of the research subject. The next stage involves planning teaching materials, devices, and instruments. Before being tested, all instruments, teaching materials, and devices are first validated by experts and practitioners in accordance with their field of expertise. After the validation process is complete, the next step is the implementation of a trial (field trial)

a. Results of Preliminary Analysis

The first step in the process of developing a STEAM Learning Model Based on Digital Science Teaching Materials is to conduct an analysis of the needs in elementary school, especially in grade V. The activity was carried out with the

aim of obtaining information about the learning process that has been taking place in grade V of elementary school, especially related to the teaching materials used by teachers, as well as the creativity ability of students in elementary school.

b. Results of the analysis of learning implementation

The implementation of learning in the classroom is the most important part in achieving one learning goal. Of course, in the learning process there are various components that greatly affect so that these goals can be achieved. Some of these components are related to the curriculum and learning materials, teacher readiness, and the involvement of students in science teaching materials.

1) Curriculum and Learning Materials

The suitability of the curriculum used, such as the Independent Learning Curriculum, has integrated materials in science learning that are relevant to the daily lives of students. Science material covers topics such as living things, the environment, objects, energy, and natural phenomena. Some materials are considered too abstract for the understanding of elementary school students, especially for lower grades. For example, the concept of energy or force often requires a more concrete approach. The observation results show that teachers still do not adjust to the applicable curriculum so that the learning outcomes of students will also be affected because the curriculum is not in accordance with the competence of a teacher.

2) Learning Methods

The right learning method helps students understand the material better, especially if it is adjusted to their level of ability and learning style (visual, auditory, kinesthetic). Varied methods such as discussions, games, or collaborative projects make students more interested and motivated to learn.

However, the learning carried out by teachers shows that some concepts are difficult to understand theoretically by students. This is the cause of low credibility of students in the learning process. The use of a dancing learning method will create a learning atmosphere that is conducive, relevant, and oriented to the needs of students. Ultimately, this not only supports academic success but also the holistic development of students

3) Teacher Competence

Teacher competence is one of the determinants in the implementation of learning. Because with good competence, it will make it easier for teachers to learn and make students motivated to participate in learning activities. So teachers must pay attention to several things when going to carry out learning, for example. Teacher Readiness: Many teachers already have the basic competencies to teach science, but some still need further training, especially in the application of STEM-based approaches (Science, Technology, Engineering, Mathematics) and teaching innovations: Teachers who are creative and innovative in using learning media tend to get better student learning outcomes.

The results of interviews with teachers show that teacher competence still needs to be improved because this will have an impact on the creativity of students in the learning process. And of course, science learning outcomes will not experience a significant increase.

4) Student Engagement

Students' involvement in learning is the level of participation, enthusiasm, and attention of students to the learning process. This engagement reflects how actively students interact with the material, teachers, peers, and learning environment to achieve learning goals. Student involvement can occur in various aspects, such as cognitive, emotional, and behavioral, which support each other in creating meaningful learning experiences. In science learning, students tend to be more enthusiastic which involves direct activities, such as experiments or nature observations. There is still a gap in Students' understanding of the concept of Science, especially if the teaching method is too theoretical and irrelevant to the Students' daily experience.

5) Use of Teaching Materials

Teaching materials are all forms of material, both written and unwritten, that are used by teachers to assist students in achieving learning goals. Teaching materials are designed to convey information, facilitate learning activities, and help students understand certain concepts or skills. With teaching materials that are designed effectively, learning becomes more structured, interesting, and in accordance with the needs of students.

The findings show that the use of teaching materials in science learning in elementary schools (SD) shows various patterns and challenges, especially related to the switch to digital-based teaching materials. Here are some of the main findings, including a) Dominance of Printed Teaching Materials, Many teachers in elementary schools still rely on printed teaching materials such as package books and supporting books. These books are the main guide in learning science, but sometimes the materials provided are not in-depth so teachers need to add other teaching materials to complement the needs of students, b) Limited use of digital teaching materials Although there is already the use of digital teaching materials such as Power Points and learning videos, the frequency of use is still low. Most teachers feel that the teaching materials currently available do not support the independent learning of students at home. This reflects the need for further innovation in the development of interactive and integrated digital teaching materials, c) the need for the development of digital teaching materials that are able to facilitate student-centered learning and support 21st century skills, such as critical thinking, creativity, communication, and collaboration. Examples of effective digital teaching materials are those that integrate videos, interactive simulations, and evaluations in one platform and d) Implementation Barriers, The main obstacle in the implementation of digital teaching materials is the lack of teacher training in developing and utilizing technology optimally. In addition, the limitations of facilities such as technological devices in some schools are also an obstacle.

3.2. Design Stage

The design stage aims to compile learning tools. At this stage, there are four main steps that need to be taken: (1) designing a criterion-test construction, (2) selecting a learning medium (media selection) that is in accordance with the characteristics of the material and objectives, (3) determining the format (format selection), namely by reviewing various formats of existing teaching materials and selecting the format to be developed, and (4) preparing an initial design according to the selected format. The steps are as follows:

a. Preparation of a criterion-referenced test

According to Thiagarajan et al. (1974), the preparation of the benchmark reference test is a step that bridges the define stage with the design stage. This test is designed based on the specifications of learning objectives and analysis of student characteristics. Furthermore, the learning outcome test grid is prepared by considering the level of cognitive ability. The scoring process uses an evaluation guide that includes an answer key as well as a scoring guideline for each question item.

b. Media selection

The process carried out in media selection is the process of determining the most appropriate tools, methods, or materials to deliver learning materials to achieve certain learning goals. The selected media must be able to support the learning process designed to take place effectively and efficiently, taking into account the characteristics of students, materials, and learning contexts. In addition, the media is selected based on the results of concept analysis, task analysis, user characteristics, and distribution plans, taking into account the different attributes of each type of media. The selection of this media aims to support students in achieving basic competencies. Thus, the media was chosen to maximize the use of teaching materials in the development of learning modules in the classroom.

The process at this stage includes the preparation of planning documents, which consist of the needs of students and the text of teaching materials. The material script includes teaching material plans, implementation plans, and materials in the form of text, videos, and images. The test script document includes assessment instruments and practice questions. Meanwhile, the assessment document includes instruments and questionnaires given to material experts, media experts, as well as responses from teachers and students.

At this stage, various resources needed to develop the product are collected, such as applications used in the manufacture of teaching materials, learning resources, and supporting facilities and infrastructure. This process begins by identifying learning outcomes and objectives that are in accordance with the results of needs analysis from initial observations, interviews with teachers, and observations of students. After the learning outcomes and objectives are determined, the next step is to prepare an activity implementation plan. The activity plan is prepared based on the draft teaching materials that will later be used by teachers independently in the learning process.

Furthermore, identification is carried out regarding the facilities and infrastructure needed to support the operation of the product to be developed. The STEAM Learning Model product Based on Digital Science Teaching Materials to

increase student creativity (BADIK) will be in digital/online form, which can be accessed through computer screens, laptops, or smartphones.

c. *Format selection*

The selection of formats in the development of the STEAM Learning Model Based on Digital Science Teaching Materials aims to design a learning structure, choose the right strategies, approaches, learning methods, and learning resources. The chosen format must meet the criteria of attractiveness, facilitation, and support of students in the learning process, so that they can develop creativity well.

Regarding the content of the materials used in this product, the material is generally obtained from various sources such as printed books for grade V elementary school and the internet. The collected materials are then compiled and designed to be presented in the STEAM Learning Model Based on Digital Science Teaching Materials. This content is presented in a variety of formats, such as text, images, animations, videos, as well as assessment instruments.

d. *Initial design*

Thiagarajan explains that "initial design is the presenting of the essential instruction through appropriate media and in a suitable sequence." The initial design in question is the overall design of the STEAM Learning Model Based on Digital Science Teaching Materials which must be completed before the trial is carried out. This process includes various structured learning activities such as reading texts, interviews, and skill development through teaching practice. At this stage, several activities are carried out, including developing ideas, analyzing concepts and tasks, compiling initial program descriptions, and designing initial teaching materials. Here's a further explanation of these activities:

Idea Development. This idea includes the display, learning, and form of a STEAM learning model based on Digital Science teaching materials that are able to present content in the form of text, images, and learning videos. The STEAM Learning Model Based on Digital Science Teaching Materials in question is digital media that can be accessed or learned by students through computers, laptops, or smartphones.



Figure 1. Initial display of the STEAM Learning Model Based on Digital Science Teaching Materials to Increase Creativity (BADIK)

Analyzing the material. Materials are obtained from various sources that are in accordance with the learning objectives that have been set in the plan. The next step is to compile a scope of material that is relevant to the learning objectives. In addition, it is necessary to prepare a concept map as a guide for the flow of the material to be studied, a grid of questions to measure the achievement of learning objectives, and test scripts in the form of pretest and posttest

questions to assess students' understanding of concepts. All documents produced need to go through an assessment and validation process to be in accordance with the set standards, so they must be consulted with material experts.

The creation of material design is just digital science. In this activity, it is to determine learning objectives, identify learning outcomes and learning objectives. then make clear and relevant learning objectives. Then create teaching materials consisting of topics, goals, and benefits. Describing the content of teaching materials. After that, the students prepared a learning evaluation instrument. After that, the teaching materials that have been designed are put into the canva application, where in the application digital science teaching materials are made in an interesting and interactive manner and each part of the teaching materials is prepared with a menu button. So that teachers and students can learn in an interesting and interactive way.

3.3. Development

At this stage, some of the activities carried out include the development of ideas, analysis of concepts and tasks, preparation of initial program descriptions, and making complete designs of the developed teaching materials. All of the ideas developed in this early stage include the appearance and form of teaching materials that can present content in the form of text, images, and videos. The designed Digital Science Teaching Material-Based STEAM Learning Model can contain the content in a digital format that can be accessed and read through a computer, laptop, or smartphone.

This development process includes processing the content in the modules, such as text, images, practice questions, and videos, so that they can be easily read on computer devices, laptops, or in other digital formats. The components of these teaching materials are similar to the components of teaching materials in general, consisting of pages, identities, prefaces, table of contents, learning materials, LKPD, and assessment instruments.

The learning activities presented in the STEAM Learning Model Based on Digital Science Teaching Materials include learning activity 1 with the material "Science grade V elementary school adapted to the independent curriculum". The presentation of these teaching materials involves STEAM activities that are integrated with teaching materials, LKPD, assessments, summaries, and glossaries.

This product cover page features a key design that has been digitally crafted using the Canva app. At the beginning of the STEAM Learning Model Based on Digital Science Teaching Materials to increase Creativity (BADIK), a welcome display, the name of the author, and a STAR button menu are provided to start access to the teaching materials. The title page display can be seen in Figure 2.



Figure 2. The home page on the App

The components of the table of contents, the content of teaching materials, LKPD, and glossary have been designed in an interesting way so that participants

Didik feels happy when learning and concept maps are an important component in a product. A concept map is given so that the weaver has an overview of the scope of the material presented. As for the presentation of the material, it was presented in an attractive manner and given coloring according to the characteristics of elementary school age students.

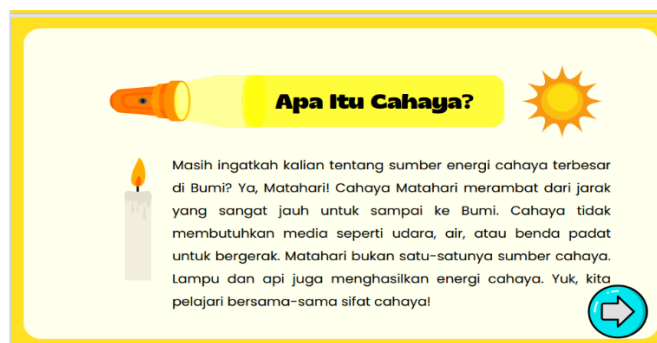


Figure 3. The display of the content of the material in the form of a presentation

In the presentation of the material, the content is presented in various forms, such as text, images, videos, and is equipped with assessment instruments for each learning activity. These contents are developed by applying the principles of multimedia design proposed by Mayer (2009). The material is arranged using simple and clear language, so that it is easy for students to understand. The text presented is complemented by the use of color, as well as bold and italic letters to highlight keywords in the material, such as in the subchapter headings. The selection of font size and font size is also regulated to support the clarity of the STEAM Learning Model Based on Digital Science Teaching Materials (BADIK).



Figure 4. Illustration of the description of the teaching material

The STEAM Learning Model Product Based on Digital Science Teaching Materials (BADIK) is equipped with practice questions. Practice questions are presented at the end of the learning activity. In this question exercise, a multiple-choice question is made which is arranged in a HOTS form which is in the form of multiple choice and consists of 5 questions. The evaluation questions are designed to see the extent of students' abilities after participating in science learning. This question is made in an interesting way so that students have the motivation to complete each question item in the STEAM Learning Model Based on Digital Science Teaching Materials to Increase Creativity (BADIK).



Figure 5. Display of Questions in BADIK teaching materials

4. Conclusion

Based on the research conducted on the development of a STEAM learning model based on digital science teaching materials, several conclusions were obtained as follows:

- Model Development Concept This learning model is designed by integrating the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach into digital science teaching materials. This development aims to create a more interactive, exploratory, and project-based learning experience.
- Development Stages The process of developing digital teaching materials is carried out through several stages, namely Needs Analysis: Identifying challenges in science learning and how the STEAM approach can be applied. Model Design: Developing the design of digital teaching materials by integrating STEAM elements, Digital Teaching Materials Production: Creating interactive learning media that can be accessed by students, Initial Evaluation: Conducting initial validation of the design of teaching materials to see if they are suitable for learning needs.

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