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# STUDY OF THE USE OF STEM-BASED LEARNING MEDIA

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## Abstract

This study aims to examine the use of STEM-based learning media in various educational perspectives. This literature review analyzes several previous studies that have addressed the effectiveness and implementation of the use of STEM-based learning media on 21st century learning outcomes and skills. This article is a literature review using content analysis techniques using the Systematics Literature Review with Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) approach. The journal criteria used in this study are related to learning media and STEM. The PRISMA approach is carried out through several stages, ranging from

identification, screening, and publication selection. The results of the study show that the application of STEM-based learning media is very important in improving scientific literacy, mathematical literacy, improving learning outcomes, and can facilitate early childhood scientific skills. The results of this research are expected to provide in-depth insights for educators, curriculum developers, or researchers in designing or implementing innovative STEM-based learning media and improving the abilities of 21st century students.

**Keywords:** Learning media, STEM

**Abstrak**

Penelitian ini bertujuan untuk mengkaji pemanfaatan media pembelajaran berbasis STEM dalam berbagai perspektif pendidikan. Tinjauan pustaka ini menganalisis beberapa penelitian terdahulu yang telah membahas efektivitas dan implementasi pemanfaatan media pembelajaran berbasis STEM terhadap capaian dan keterampilan belajar abad ke-21. Artikel ini merupakan tinjauan pustaka dengan teknik analisis isi menggunakan pendekatan Systematics Literature Review with Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA). Kriteria jurnal yang digunakan dalam penelitian ini berkaitan dengan media pembelajaran dan STEM. Pendekatan PRISMA dilakukan melalui beberapa tahapan, mulai dari identifikasi, penyaringan, hingga seleksi publikasi. Hasil penelitian menunjukkan bahwa penerapan media pembelajaran berbasis STEM sangat penting dalam meningkatkan literasi sains, literasi matematika, meningkatkan capaian pembelajaran, dan dapat memfasilitasi keterampilan sains anak usia dini. Hasil penelitian ini diharapkan dapat memberikan wawasan yang mendalam bagi para pendidik, pengembang kurikulum, atau peneliti dalam merancang atau mengimplementasikan media pembelajaran inovatif berbasis STEM dan meningkatkan kemampuan peserta didik abad ke-21.

**Kata Kunci:** Media pembelajaran, STEM

## INTRODUCTION

The rapid development of science and technology is a result of the development of modern times. Where technological developments have given rise to innovations from various fields of technology whose creation aims to provide convenience in human activities (Hulwani et al., 2021). Technology that aims to facilitate human work that is urgently needed, for example in the world of Education. In today's rapid technological development, educators are required to be more innovative in utilizing technological developments in the learning process (Rahmawati & Junaidi, 2022).

In the modern era, the development of technology and information that develops is very rapid and its influence is inevitable, especially in the world of education, both in terms of negative and positive influences. So that the world of education is required to always follow technological developments as an effort to improve the quality of education such as utilizing the development of information technology, especially in improving the facilities and infrastructure of the teaching

and learning process. One example of the use of technology in learning is to use technology resources as a medium in the learning and teaching process (Akhmadan, 2017).

Learning media is a very important thing in the learning and teaching process. Learning media itself can help educators in delivering material, packaging material into content that is interesting for students, making the material more concrete, so that the material presented can be more interesting to students and easy to understand. An educator must have the ability to design and implement various learning strategies that are considered to be in accordance with the interests and talents and in accordance with the development stage of the students, including in utilizing various learning media sources to increase learning effectiveness (Sanjaya, 2010). A study conducted by Herawati (2017) said that the use of learning media can increase new desires and interests, arouse motivation, stimulate teaching and learning activities, and have a psychological influence on students. So it can be concluded that there is a relationship between learning media and technology that has an attraction in the learning process.

Learning media is developing rapidly, especially technology-based learning media. Various learning media are packaged in a modern and attractive form, such as in the form of pocket books, E-LKPD, interactive media, interactive learning videos, and teaching modules designed according to the needs of students.

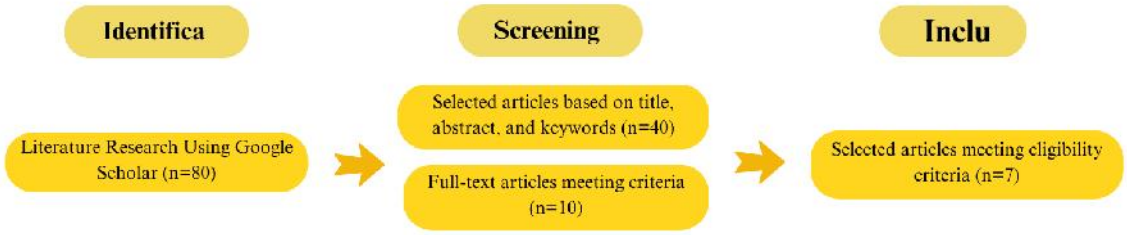
The use of STEM approaches in the learning process can produce creative, innovative learning, and improve educational standards and student learning outcomes. Through the STEM approach, students learn science, technology, engineering, and math to be able to hone the problem-solving, critical thinking skills that are an essential part of 21st century skills.

Based on one study (Handayani, 2021), the average questionnaire results when using learning media in the form of STEM-based digital comics got a percentage of 97.85%. According to (Retnoniingsih et al., 2021), learning media developed with a STEM approach can support learning materials with a comprehensive point of view.

Learning media is a very important facility in supporting learning processes and outcomes, and is integrated with STEM approaches that can improve 21st century skills. This review analysis aims to provide an overview of STEM-based learning media that can be used to improve learning outcomes and have a significant impact on learning.

## METHODS

The scope of this research is to examine STEM-based learning media. The method used in reviewing this article is *The Preferrend Reporting Items for Systematic Review and Meta-Analyses (PRISMA)* by analyzing aerticellles starting from article analysis, filtering, and inclusion (Ariati & Junaisi, 2022). The articles used by the author are articles published from 2020 to 2025, and 80 relevant articles have been found. The journal criteria used for the review needs of this article are those that discuss learning media and STEM. After conducting a thorough analysis stage, the researcher decided to sample 7 articles. In the process of analyzing the report through PRISMA, the author presents in the material shown in figure 1 as follows.




Gambar 1. Flowchart Research

Journal articles, research reports, and other primary sources have been cited in the article, so they can form the work of the article, then it can form the author's thoughts to become the outline of this review article. After the stage of the author's thought to become the outline of this review article. After the stages entirely. After reading several collections of reference sources systematically, the next stage is to synthesize ideas from various existing problems.

## RESULT AND DISCUSSION

The results of the analysis of 80 journals that have been taken using the PRISMA method and several stages, the results of the screening are obtained 7 articles that will be examined in depth. The following are 7 journal articles that the author has presented in table 1.

Tabel 1. Literature Review Result

| Author | Heading | Media | Result |
|---|---|---|---|
| Yatin et al. 2023 | Development of STEM-Based E-Modules with Canva Media to Improve Science and Numeracy Literacy. Groups and Numeracy of Junior High School Students | E-Module | Learning and teaching activities using STEM-based E-Modules can improve students' abilities in science literacy and numeracy. The experimental and control groups had a significant increase with an N-Gain of 0.44 for the experimental class and 0.22 for the control class. |
| Sa'diyah, Zhendi Noviatus et al. 2024 | Development of STEM-Based Digital Comic Media on Human Respiratory System Disorders | Comedian Digital | The creation of STEM-based digital comics obtained results in the form of media that can overcome the problems in this study. This media has conducted a validation test by obtaining a percentage result of 88.8% for material validation and 87.8% for media validation, both of which have very valid criteria. Based on all the results of the validity test, it shows that this media can be used as a means of teaching and learning in the classroom. |

| | | | |
|---|---|---|---|
| Sulistyawati, Eka et al, 2021 | Development of STEM-Based Learning Media for Hydraulic Houses in Review from Learning Outcomes and Responses to Mathematics | Hydraulic Housing | Based on the results of the feasibility questionnaire from media and material validation, a score of 89.2% and 83% with feasible criteria. Meanwhile, the results of the practicality questionnaire obtained 94% results in the category of very practical, while the students' scores reached an average above the KKM that had been determined by the school. |
| Nurmala, Siti, et al, 2021 | Development of *Articulate Storyline 3* Media in STEM-Based Science Learning to Develop Creativity of Elementary/MI Students | *Articulate Storyline 3* | The results of this study obtained a percentage of assessment feasibility from material experts of 79.8%, with a valid category, a media expert assessment of 97.9% with a very valid category, and a linguist's assessment of 87.5% with a very valid category. The results of student responses to the individual test were 95.02%, the small group test was 95.65%, and the large group test was 91.16%. Based on these results, it can be concluded that the media articulate storyline 3 product in STEM-based science learning to develop students' creativity is feasible and effective in the learning process. |
| Santika, Desi Arianti, et al. 2020 | Development of STEM Model Learning Media on the Concept of Floating and Sinking to Facilitate Early Childhood Scientific Skills | *Sink, Float, and Fun* | Based on the results of research and development, STEM model learning media on the concept of floating, floating, sinking to facilitate early childhood scientific skills is feasible to use. |
| Ananingtyas, Ratika Sekar Ajeng, et al. 2022 | Development of Arduino-Based Learning Media in STEM Learning in Improving Science and Digital Literacy | Audine | The learning media developed is suitable for use in STEM learning to improve science and digital literacy, as evidenced by the data from the feasibility test results with an average score of 3,862 which means very good. |
| Setiawan, Asep, et al. 2024 | Development of STEM-Based Animation Videos as Learning Media to Improve Students' Mathematical Literacy Skills | Animated Videos | The effectiveness test obtained an N-gain percentage of 58.91% which is quite effective. The results of this study show that the STEM-based animation videos made meet the criteria of valid, practical and effective and are suitable for use. |

Based on table 1, it can be seen that the implementation of STEM approaches in learning media has an effect on learning, although there are challenges in its implementation. According to (Yatin et al. 2023) in the table of observations in junior high school students, using STEM-based E-Module learning media can improve students' abilities in science literacy and numeracy to the environment. In addition, this STEM-based E-Module using Canva is presented online which can increase the attraction or positive response as a student learning experience. In addition, by implementing the STEM approach, students are required to solve problems in daily life.

Based on the results of observations (Sa'diyah, Zhendi Noviatus et al. 2024) in the table shows that STEM-based learning media meets the categories of valid, feasible, practical, and effective use in learning. Meanwhile, the research (Ananingtyas, Ratika Sekar Ajeng, et al. 2022) shows that STEM-based learning media is suitable for use in learning and can improve science and digital literacy, as evidenced by the data from the feasibility test results by obtaining an average score of 3,862, which means it is very good.

Meanwhile, according to (Setiawan, Asep, et al. 2024) in the table, STEM-based learning media in the practicality test received an N-gain percentage of 58.91% which is classified as quite practical and able to improve students' literacy skills. Meanwhile, the results of observations from (Santika, Desi Arianti, et al. 2020) show that STEM-based learning media can facilitate early childhood scientific skills that are suitable for use.

Another research conducted by (Sulistyawati, Eka et al. 2021) found that STEM-based learning media, in addition to meeting the validity, practicality, effectiveness, and feasibility tests, can also increase student scores to reach an average above the KKM that has been determined by the school. In addition, according to research (Setiawan, Asep, et al. 2024), the use of STEM-based learning media in addition to meeting the practicality, validity, feasibility, and effectiveness tests by obtaining an N-Gain percentage of 58.91%, can also improve literacy skills

## CONCLUSION

Learning media is very important in the learning process to make it easier to deliver material, in addition to learning media can attract attention and increase student motivation, and by using learning media can overcome the limitations of space, time, and senses. As well as learning media in the form of E-modules, learning videos, digital comics and so on. Students can access these learning media anywhere and anytime in a practical way.

The STEM approach has a very important role in improving the quality of Education. By integrating Science, Technology, Engineering, and Mathematics (STEM), especially in learning media, it not only helps students understand concepts in depth and contextually, but can also develop 21st century skills including critical thinking skills, problem solving, creativity, collaboration, and communication. In addition, STEM-based learning media also encourages students to be able to collaborate more actively and be motivated in the learning process in preparing themselves to become someone competent and innovative in the digital era.

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