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Effectiveness of Digital Learning Media Using 3D Animation to Improve Elementary School Science Learning Outcomes : Literatur Review

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ABSTRACT

Digital learning media with 3D animation has become a trend in education, especially to improve science learning outcomes in elementary schools. This research examines the effectiveness of digital learning media using 3D animation in improving elementary school science learning outcomes. The method used is a literature review over a period of 5 years (2019-2023). The results of this research obtained data from the scholar.com database with the keyword digital learning using 3D animation in science subjects totaling 1,470 articles and 6 articles that met the inclusion criteria for analysis. Digital learning media with 3D animation is an effective learning media for improving elementary school science learning outcomes.

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ABSTRAK

Media pembelajaran digital dengan animasi 3D telah menjadi tren dalam pendidikan, terkhusus guna meningkatkan hasil belajar IPA di SD. Penelitian tersebut menelaah efektivitas media digital menggunakan animasi 3D dalam meningkatkan hasil belajar IPA SD. Metode yang dipakai ialah literature review dalam jangka waktu 5 tahun (2019-2023). Hasil penelitian tersebut didapatkan data berdasarkan database scholar.com memakai kata kunci pembelajaran digital menggunakan animasi 3D pada pelajaran IPA sebesar 1.470 artikel dan 6 artikel yang terpenuhi kriteria inklusinya guna dilaksanakan analisa. Media digital dengan animasi 3D ialah media pembelajaran efektif guna meningkatkan hasil belajar IPA SD.

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Introduction

Primary school education is a crucial early stage in child development (Muflih. et al., 2023). At this stage, children build a foundation of insights and abilities that can be a provision for students for the next level of education and life in the future. Thus, it is important to ensure that the learning process in elementary schools takes place effectively and efficiently (Ina et al., 2023).

Science is an important subject in elementary school that plays a role in equipping students with insight and understanding of natural phenomena and their interactions with humans. Effective science learning in elementary schools can help students to develop curiosity, critical thinking, and problem-solving skills, which are important provisions for their future (Rizki et al., 2023).

Although science has an important role, there are several challenges in science lessons in elementary schools, such as low student interest and learning motivation. Students often think that science is a difficult and boring subject. This can be caused by monotonous teaching methods, abstract lesson contexts, and lack of variety in the delivery of material (Ika & Margunayasa, 2023).

Not only that, students also have difficulty in understanding abstract concepts. Science concepts are often abstract and difficult for elementary school students to understand. This can cause students to have difficulty in learning and understanding the subject matter. As well as the limitations of the media used. The media used in elementary science teaching is often limited and less interesting. This can make students not careful and difficult to master the subject matter (Riva, 2023).

Digital learning media based on 3D animation has the potential to overcome these challenges and increase the effectiveness of science learning in elementary schools (Ajat & Arita, 2023). 3D animation can present realistic and interesting visualizations, thus helping students to easily master abstract and complex concepts in science.

One type of digital learning media that is interesting to study is 3D animation. According to (Puay et al., 2023) 3D animation has several advantages compared to other types of digital learning media, such as 3D animation can present realistic and interesting visualizations compared to static images or 2D videos. This can help students to easily master abstract and complex concepts.

3D animation can be made interactive, where students are able to contribute to the teaching. This can increase students' drive and participation in learning. 3D animation can be

accessed easily with a variety of devices, such as computers, laptops, tablets, and smartphones. This allows students to learn anytime and anywhere.

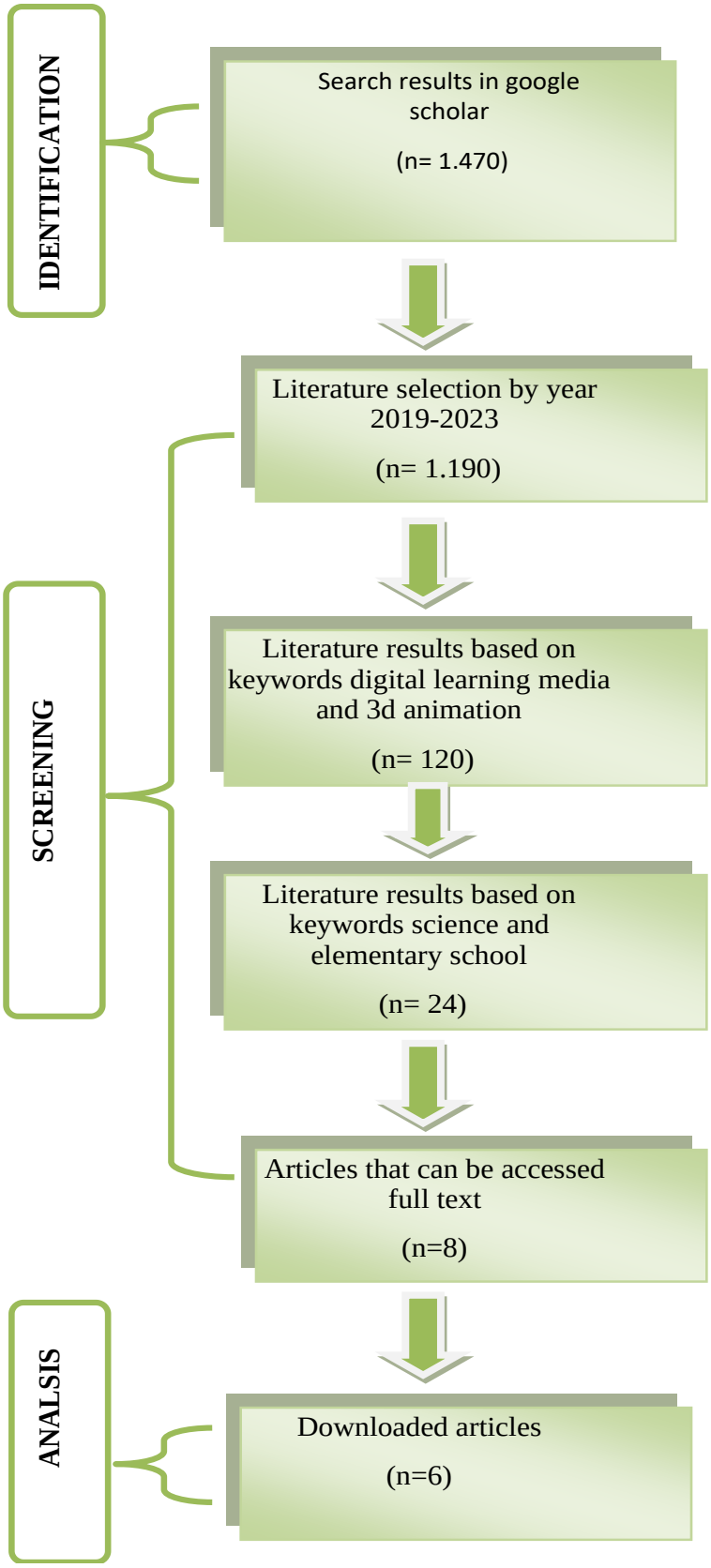
Several studies have shown that 3D animation can increase the effectiveness of learning in various fields, including math, science, and language in elementary schools. Research by Yafa et al., (2020) shows that the majority of media applied are digital media such as images, videos and so on because of this media students have the urge to learn and curiosity about the context of teaching. Research Friska et al., (2022) shows that E-LKPD is made to obtain good standards, feasible and interesting e-LKPD applies to the school teaching stage. It can be said that students' enthusiasm, concentration and interest increase and affect learning outcomes well. Research by Arizka & Sari Sitepu, (2023) shows that the development of PUBAL 3D media (3D Block Puzzle) using the resech and developmend (R&D) method in science lessons can foster academic results and mastery of grade 3 SD.

Although research on the effectiveness of 3D animation-based digital learning media has been conducted in various fields, there is still limited research on the effectiveness of 3D animation-based digital media in science learning in elementary school. In today's digital era, it is important to equip students with 21st century skills, such as creativity, critical thinking, and problem-solving skills. Digital learning media such as 3D animation can be the solution. Therefore, the researcher will raise the title of the literature study: the effectiveness of 3D animation-based digital media to improve elementary science learning outcomes.

Research Methods

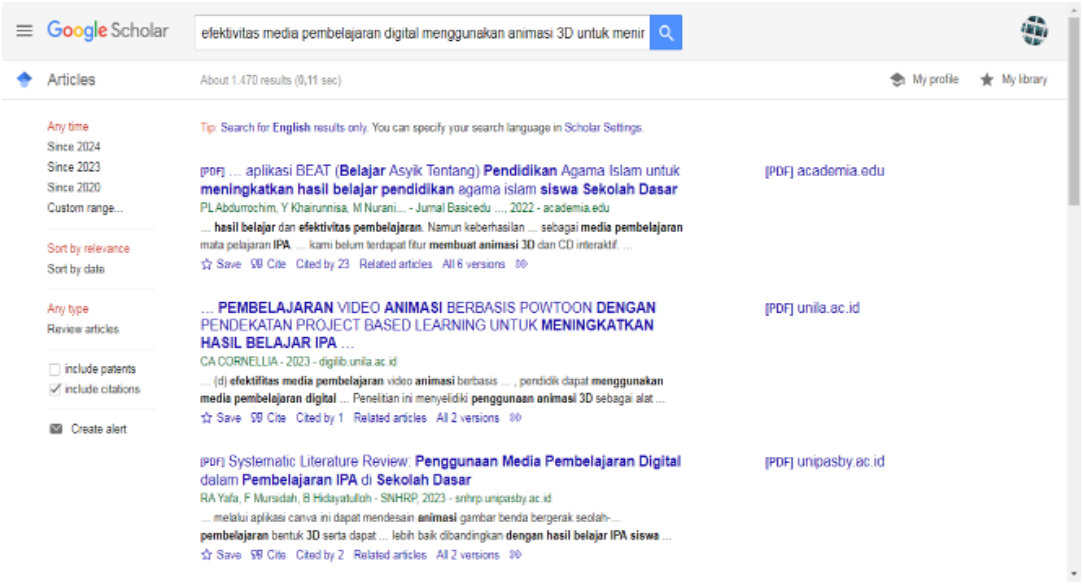
This research uses the literature review method to collect and analyze information based on various aspects, such as journals, books, newspapers, and so on. The main purpose of the literature review is to strengthen the theoretical basis and enrich the information in the research study (Sugiyono, 2010).

The research is focused on discussing literature reviews relevant to the topic "The effectiveness of 3D-based digital learning media in improving elementary science learning outcomes". The articles reviewed in this study came from the Scholar database and only considered articles published from 2019 - 2023. The analysis was conducted in March 2024 using the keyword "Effectiveness of 3D-based digital learning media to improve elementary science learning outcomes" on the scholar.google.com page. The data collected only comes from the database and is focused on "article documents".


IDENTIFICATION
Search results in google scholar
(n= 1.470)
SCREENING
Literature selection by year 2019-2023
(n= 1.190)
Literature results based on keywords digital learning media and 3d animation
(n= 120)
Literature results based on keywords science and elementary school
(n= 24)
Articles that can be accessed full text
(n=8)
ANALSIS
Downloaded articles
(n=6)

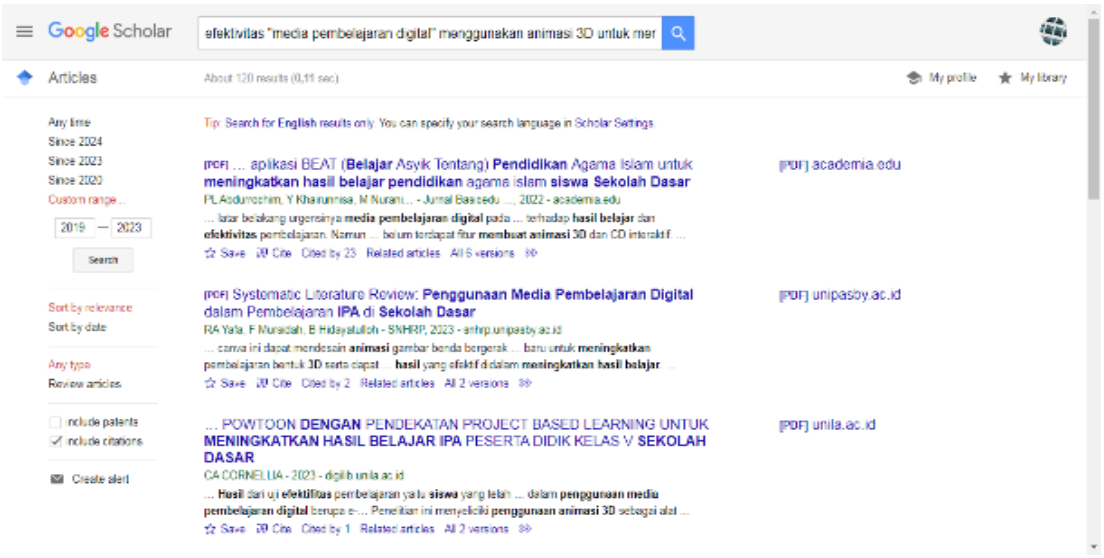
Result

The data in the study are documents in the form of articles. Analysis of article literature is carried out on the scholar.google.com website. Obtained 1,470 literature from the scholar database consists of two types, namely books and articles. This research focuses on articles by searching using 3 keywords, namely digital media, 3D animation, and ipa learning outcomes.

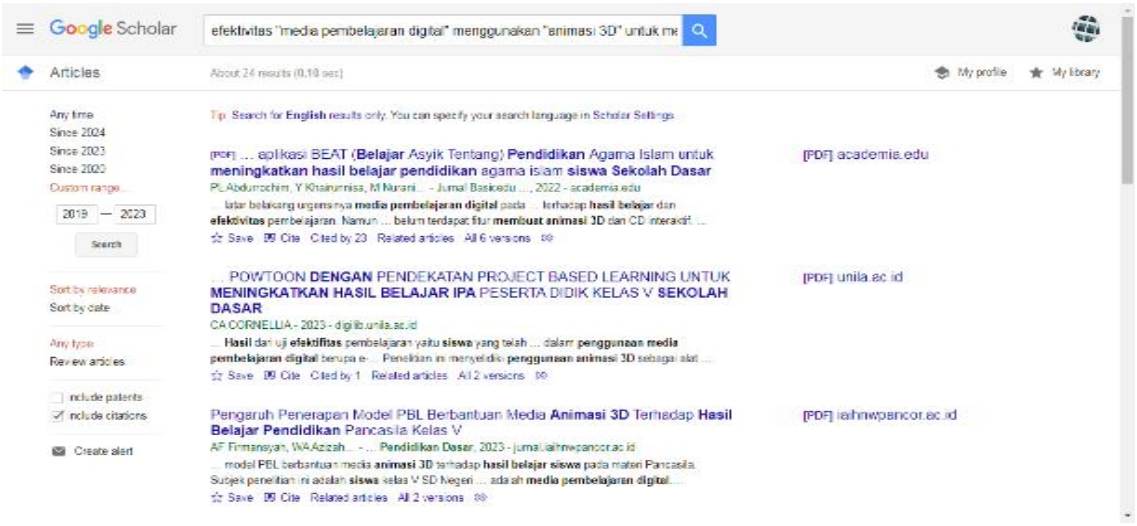


Search stage 1 article search using the title obtained 1,470 documents.

Figure 2. Search stage 2 is limited to the time range of publications in 2019-2023 obtained 1,190 documents.



Search stage 3 using the keyword "digital media" obtained 120 documents



Search stage 4 using the keyword "3D animation" retrieved 24 document

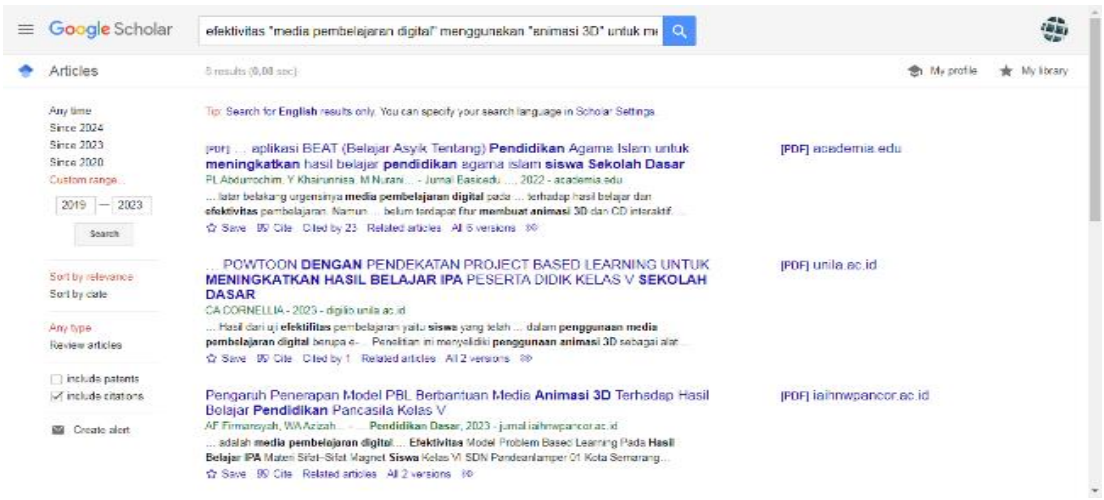


Figure 5. Stage 5 search using these keywords obtained 8 documents

In the fifth stage, data was collected from a strict selection of documents on article types. Documents in the form of books or others were not taken into account. Based on the 8 articles found, some of them did not meet the criteria for research discussion due to various reasons, not discussing the research subject, ineligibility of documents and ineligibility of the title of the research.

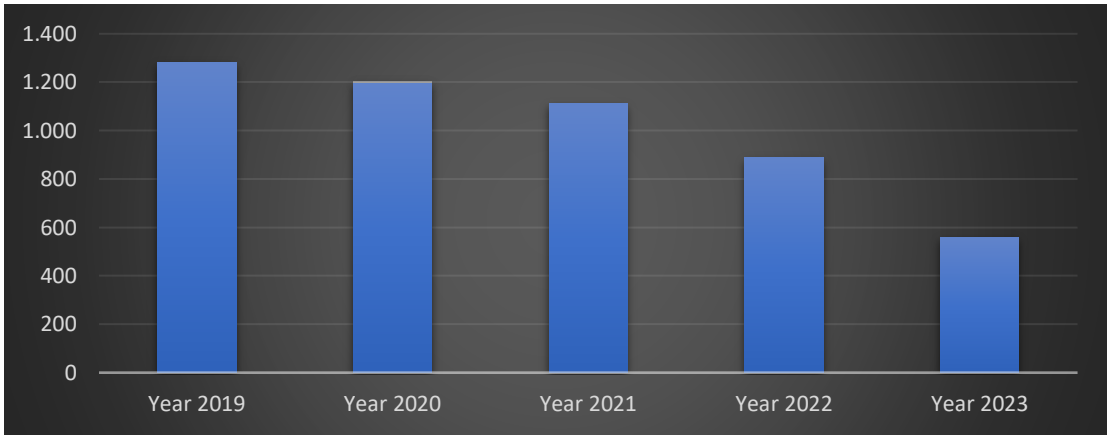


Diagram 1. 2019-2023 scholar publication data

The diagram directs the total publication of articles using the keywords of the effectiveness of digital media using 3D animation to improve elementary school science learning outcomes. In 2019, 1,280 articles were published. In 2020 the total number of published articles remains at 1,200 articles. In the following year, 2021, there were 1,110 total publications. In 2022 there was a decrease to 887 articles detected, in 2022 there were 887 articles published and 2023 there was a large decrease of 558 articles, which means that the number of articles based on 2019 - 2023 amounted to 5,035 articles. Then from this process, articles are selected to be assessed and the results of the assessment are as follows:

No	Article	Results or Findings	Recommendations
.1.	*Systematic Literature Review: The Use of Digital Learning Media in Science Learning in Elementary Schools (Yafa et al., 2023)*	From the results of an organized review of various studies that have been published, it can be stated that digital media can be used in science teaching activities. The media used are digital media such as images, videos, because of the media that students have the urge to learn and curiosity about the material in learning..	The recommendation from this study is to further integrate the Problem Based Learning model using Wordwall media in teaching to improve learning outcomes.
2.	Discovery Learning: Application in science learning assisted by interactive digital teaching materials to improve student learning achievement (Khamidah et al., 2019)	The results of the study indicated that there was a great influence based on the application of interactive digital teaching materials through the discovery learning model on student academics.	The discovery learning model can be applied to science to improve teaching activities and strengthen knowledge.
3.	Improving Science Learning Outcomes of Fifth Grade	The results of the validation test analysis used are seen if the	It is recommended to continue developing

	Students with Animated Video Learning Media (Dian Supriyani et al., 2021)	science animation video in improving the academic results of grade V science in the development of animated video media through science lessons is able to help educators to explain the material and help students to master the material during online teaching.	animated video-based media on science discussions in class V, given its positive potential to improve learning outcomes.
4	Development of Creator-assisted E-Books on Human Blood Circulatory System Material to Improve Learning Outcomes of Grade V Elementary Students (Madina & Zulherman, 2023)	E-Book assisted by Book Creator in the discussion of the human circulatory system is good to apply, easy and good to develop students' academic results.	The research makes a good case for developing and improving the quality of digital learning media, and emphasizes the importance of technology integration in the learning process in schools.
5.	Development of 3D Animation Video Learning Media Based on Z-Cut and CapCut Applications in IPAS Learning Class IV Photosynthesis Material at SDN 1 Wajakkidul Boyolangu Tulungaung (Ergantara & Yuliana Sari, 2023)	The results of media feasibility research are shown if the 3D animation video media has feasibility and usability well seen based on expert validation questionnaires and student responses.	The recommendation from this research is that it is very suitable for use in the learning process because it is proven to be very good and very feasible to apply
6.	3D Media Development of Human Hearing Senses Material with Augmented Reality Assembler Edu (Hikmah et al., 2023)	The result of the discussion is that there is a big difference from experimental and control members where 3D media in the context of the human sense of hearing using Augmented Reality Assembler Edu is effectively able to foster student mastery.	It is recommended to continue the development of 3D media in the context of the human sense of hearing through Augmented Reality Assembler Edu can be applied to the teaching activities of grade IV students.

Diccusion

From the results of the analysis obtained 6 articles that are suitable for digital learning media using 3D animation to improve elementary science learning outcomes. Based on the

results obtained from regular reviews of various studies that have been published, it can be said that various digital media can be applied to science teaching activities. Media that is often used is digital media such as images, videos and interactive games because of the media that students have a learning impulse and curiosity about the discussion. The results of the study Khamidah et al., (2019) found that there was a great influence based on the application of interactive digital teaching materials through the discovery learning model on student academics. So, the use of interactive digital through the discovery learning model can be applied by educators in accommodating students' cognitive knowledge which increases student achievement.

The results of the research Dian Supriyani et al., (2021) analyzing the validation testing carried out, it can be seen that the science animation video in growing the fifth grade science learning outcomes developed received 4.56 with a "good" capacity. So the research makes the science video in improving the academic results of grade V science has been tested for good validation. Research by Hikmah et al., (2023) from the appropriateness of the media shows that 3D animated video media has a level of appropriateness and application well seen based on expert validation questionnaires and student responses. The results of the media experts obtained 87.5%, the material obtained 80% and the language obtained 92.5%. The results of the student response questionnaire were seen as positive with 80% categorized as positive and 20% categorized as positive.

Effectiveness of 3D-based Digital Learning Media

According to Wen-tian & Yunbiao, (2022) 3D-based digital learning media has become a rapidly growing trend in education. This technology offers various benefits to improve the quality of learning, including.

1. Increase Motivation and Interest in Learning

   Interesting and interactive 3D animations can make learning materials more vivid and exciting for students. It can foster their motivation and interest to learn.
2. Facilitate Material Understanding

   3D animation can visually present information for students to easily grasp. It helps students to master abstract and complex concepts more effectively.
3. Increase student participation and activity

   3D-based digital media can motivate students to be active and participative during teaching and learning. This is because this media allows students to interact with learning materials directly.

4. Facilitates Individualized Learning

   3D-based digital learning media can be customized to suit students' individual needs and learning styles. This allows students to learn quickly and focus on the material they need.

5. Expanding Access to Learning Materials

   3D-based digital learning media can be accessed by students anytime and anywhere. This allows students to learn outside of school hours and increases their access to learning materials.

6. Save Cost and Time

   3D-based digital learning media can save the cost and time needed to develop and produce traditional teaching materials. This is because digital media can be used repeatedly and shared easily.

While 3D-based digital learning media offers many benefits, it is important to remember that it cannot replace the teacher completely. Teachers still play a major role in guiding and instructing students during the teaching process. In addition, it should be noted that the effectiveness of 3D-based digital learning media is also influenced by several factors, such as the animation design, the teaching method used, and the characteristics of the students. Thus, it is good for educators to design and use appropriate 3D-based digital media in order to improve learning outcomes.

Educators can use 3D-based digital learning media to show demonstrations, simulations, and experiments that are difficult to do in the classroom. It can help educators to present science concepts using strategies in an interesting and interactive way. It is important to remember that the effectiveness of 3D-based digital learning media depends on various factors, such as the design of the media, the learning strategies used, and its characteristics. So, it is good for educators to choose the right 3D-based digital media and use it in an effective way to improve learning outcomes.

Conclusion

From the results of the literature that has been carried out, digital learning media based on 3D animation is proven to be effective in improving elementary science learning outcomes. This is supported by several findings, including increasing student motivation and interest in learning, facilitating understanding of the material and improving memory and cognitive abilities. Overall, 3D animation-based digital learning media is an effective tool in improving

elementary science learning outcomes. The use of this media is able to help students in mastering learning to be more effective, increase motivation and interest in learning, and improve their memory and cognitive abilities.

However, keep in mind that the effectiveness of 3D animation-based digital learning media is also influenced by several factors, such as animation design, the way teaching is applied, and student characteristics. So, the main thing is for educators to design and use appropriate 3D animation-based digital media in order to be able to improve learning outcomes well.

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