Bibliometric Analysis of Learning Design Trends Based on Animated Videos to Achieve Problem Solving Skills in Comparison Materials

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Abstract. This study aims to analyze research trends related to the use of animated videos in learning, especially in improving problem solving skills in comparison materials. The method used is bibliometric analysis based on publication data indexed by Scopus for the period 2020-2025. The data collection process was carried out through the Publish or Perish application, which was then analyzed using VOSviewer and Microsoft Excel software. The results of bibliometric visualiza-tion show that the keywords that often appear are video, animation, education, students, and development, but there is no direct relationship with problem solv-ing or comparative materials. This indicates a potential research gap to be devel-oped in the form of interactive animated video media based on contextual problem solving in mathematics learning. This research contributes to the mapping of liter-ature and the direction of the development of visual-based digital learning media innovations.

Keywords: Bibliometrics, animated videos, problem solving, comparison, VOSviewer, learning trends.

1 Introduction

Information and communication technology is currently very rapid and has a significant impact in various fields, especially in education [1]. One of the impacts of the development of information and communication technology is the changes in learning media used. Learning media acts as a means of delivering information in the teaching-learning process, allowing interaction between students and teachers. Among various technology-based learning media, animated videos are one of the most popular and widely used by the community [2]

According to Qian et al (2025) animated video is a combination of moving audio-visual media. In line with Roy et al (2025), animated video is an interesting and interactive platform that is able to convey complex information clearly and easily understood by learners. So, the definition confirms that video animation is an interactive visual tool and is able to present information effectively. Then researcher Agustina & Marlina (2023) developed animated video-based learning media that was effective in improving students' learning comprehension.

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Thus video as a learning media is an audiovisual tool that combines elements of sound and moving images to convey information, knowledge, and instructional messages to help learners understand. The existence of learning videos can increase students' motivation to learn and improve their learning outcomes [6]. Research on animated videos has been published in many academic journals and can be accessed through Google Scholar and other journal search platforms.

Several previous studies have explored the use of video animation, which has been carried out by various researchers in this field including Ulfah et al (2025) the effectiveness of the use of animated videos in increasing motivation and motor skills of learners, Research conducted by Voorde et al (2024) classification or taxonomy of the didactic role of dynamic visuals used in animated video learning mathematics. The main focus of the research is to identify and categorize the various functions possessed by dynamic visuals, such as helping to connect objects, varying objects, visualizing concepts and processes dynamically, and supporting the development of symbolic understanding, connecting mathematics with the real world, and generaliza-tion. In addition, this study also examines the animation techniques used to realize these roles in mathematics education videos. Research conducted by Beautemps et al (2024) on the effect of various animation styles in learning videos on physics learning outcomes, then research by Navarrete et al (2023) video-based learning, identifying eight categories of video characteristics that are effective in learning, in-cluding audio, visual, text, interactivity, and instructional design features. Then re-seacher Agustina & Marlina (2023) developed animated video-based learning media that was effective in increasing the learning understanding of grade X students.

Although there has been a lot of research on animated videos in education, especially in Indonesia, until now there has been no study that maps related publications with a bibliometric analysis approach using VOSviewer software based on data indexed by Scopus [11].

According to Samiri et al (2024) bibliometric analysis is defined as a quantitative method for evaluating and visualizing scientific literature, with the aim of identifying research trends, author collaboration, and the development of certain topics. In line with Donthu et al (2021) bibliometric analysis as a quantitative approach to evaluat-ing scientific literature, helps in identifying research trends and scientific collabora-tions. In practice, bibliometric analysis is often supported by VOSviewer software to assist in data analysis [14]. VOSViewer is known as one of the tools that can be used to present bibliometric maps [15]. VOSviewer is an effective tool for creating and visualizing bibliometric maps based on data from various sources [16]. VOSViewer presents a text-mining function so that it can create and describe a network (correla-tion) on the citation of an article. The usefulness of VOSViewer is to provide infor-mation about bibliometric graph maps [17]. Through VOSViewer, we can present bibliometric maps easily so that we can interpret a network map [18].

Based on the above problems, the purpose of this study is to conduct a biblio-metric analysis with computational mapping of articles related to the use of animat-ed videos to achieve problem solving skills in comparison materials in scopus indexed schools using VOSviewer software, which is expected to help other researchers in determining references to research themes to be taken, especially those related to learning videos.

2 Methods

In this research, the method used is bibliometric analysis. According to Bich et al (2024), it is explained that the bibliometric analysis method is a literature analysis by emphasizing mathematical and statistical approaches. This bibliometric analysis helps researchers to study the bibliographic content and citation analysis of each article obtained from the Scopus database. This research uses data from article search results in Scopus. To achieve the expected goals, the researchers utilized the applications (1) Publish or Perish, (2) VOSViewer, and (3) Microsoft Excel.

Referring to the opinion of Kokatnur et al (2025), there are five steps in bibliometric analysis research, namely: first determining keywords, second searching for article data, third filtering articles, fourth collecting and classifying data, fifth analyzing data. First, determining keywords, determining keywords is aligned with the need to search for research issues, because this research analyzes the use of animated learning videos in schools, the keyword is "Animated Videos" then searches with the issue "to Achieve Problem Solving Skills in Comparison Materials". Then search for related article data, while searching for this article using the Scopus database by utilizing the Publish or Perish application. In searching for articles, researchers limit the year of publication by selecting the range of 2020 to 2025, so that the results of the article search are obtained as many as 137 related articles. After searching for articles, the next step is to save the file in RIS file and CSV file formats which aims to make it easier for researchers to process data using Microsoft Excel, after which the data is processed and filtered based on the needs analysis. The next stage after filtering, then produces processed article data for the last 5 years (2020-2025), 221 articles with the most citations in 2024 listed on Scopus, and other data needed for analysis.

3 Result and Discussion

The article search utilized the Publish or Perish software. According to Kokatnur et al (2025), the bibliometric analysis method has two main principles: first, establishing relevant keywords, and second, conducting searches based on these keywords.

Based on this basis, the determination of research keywords as listed in Figure.1 is "Animated Videos", and "to Achieve Problem Solving Skills in Comparison Materials" through the title column, the maximum number of publications is 1000 articles, and limits the publication range from 2020 to 2025. Based on the articles obtained from the keyword search, according to the Scopus database, 137 articles related to animated videos were produced. Furthermore, researchers saved the data from this search into CSV format which was then processed using Microsoft Excel and the RIS format used in the VOSViewer application. The results can be seen in Figure 1.

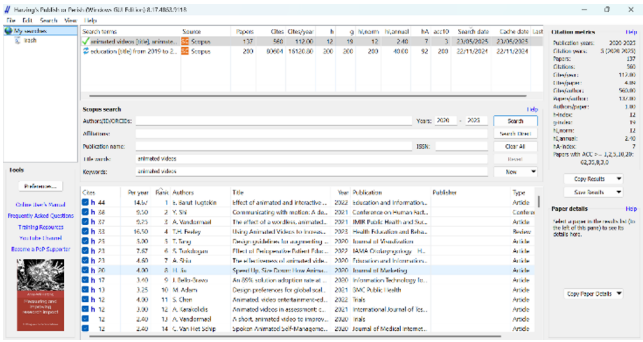

Fig. 1. Results of searching for articles by utilizing keywords in the Title column

Based on the results of the data acquisition shown in Figure 1, there are 5 articles that have the most citations. The number of citations of all articles used in this study is 560, with the number of citations per year as much as 112.00, the number of citations per article is 4.09, the average author in the article used is 1.00, the h-index of all articles is 12 and the g-index is 19.

3.1 Processing of Animated Video Search Results to Achieve Problem Solving Ability on Comparison Material

After the data was obtained through Publish or Perish, it was saved in CSV format and processed using Microsoft Excel. In accordance with Tranfield (2003), the next step is to sort the data by year range, from lowest to highest. The sorting results showed that the lowest year was 2020, while the highest year was 2025. From the results of this processing, researchers obtained the number of publications per year which is then presented in Table 1.

Based on the data in Table 1, the number of articles discussing animated videos fluctuated during the period 2020 to 2025. In 2020 there were 16 articles, increasing to 23 articles in 2021, then decreasing to 15 articles in 2022. Furthermore, the number of publications increased again with 27 articles in 2023, reaching its peak with 32 articles in 2024, before decreasing to 24 articles in 2025.

Researchers noted that 2024 showed a significant increase in the number of publications, but the number decreased in the following year. In addition, the highest number of publications occurred in 2024 with 32 articles, while the lowest number was recorded in 2022 with 15 articles. The average number of publications over the period 2020 to 2025 was 27.4 articles. This information can be seen further in the form of a graph presented in Figure 2.

Table 1. Publication by Year

Year of Publication	Number of Publications
2020	16
2021	23

Year of Publication	Number of Publications
2022	15
2023	27
2024	32
2025	24
Total	137

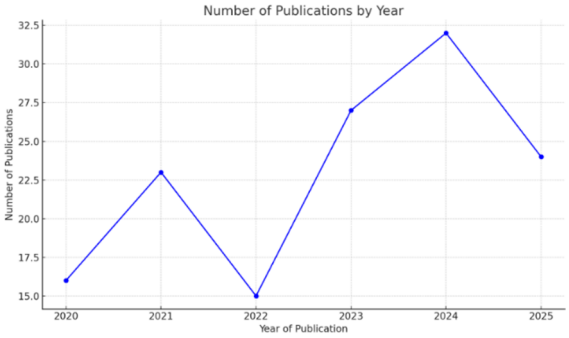

Fig. 2. Graph of Number of Publications by Year

3.2 Visualization of Video Animation Topics to Achieve Problem Solving Ability on Comparison Material Using VOSViewer

The next step in this research is to visualize the articles obtained through Publish or Perish with the help of VOSviewer software. The center of the research on animated videos is animated videos itself where there are 6 clusters or groups marked with red, yellow, green, dark blue, light blue, and purple colors and there are 22 items that correlate with animated videos including: 1) video, 2) animation, 3) education, 4) development, 5) student, 6) and application. The mapping visualization analyzed in this study is divided into 3 parts, namely 1) Network visualization, 2) Density visualization, and 3) Overlay visualization. The visualization results can be seen in Figure 3.

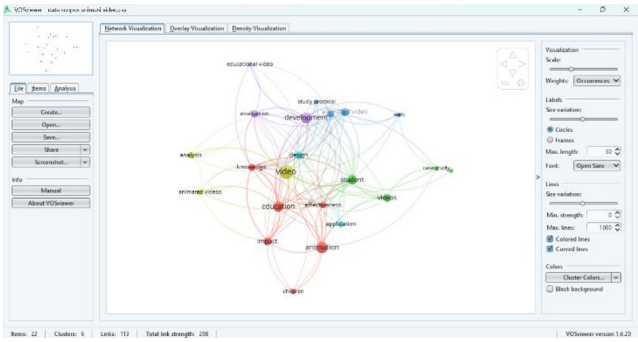

Fig. 3. VosViewer Network Visualization Results

Six clusters were identified, each representing a different thematic focus. Each cluster formed illustrates the relationship between various terms that are interrelated. Referring to the opinion of Passas (2024), each term is represented with a colored circle, where the size of the circle indicates the frequency of occurrence of the term. The more frequently a term appears in the title or abstract, the larger the size of the circle representing it, indicating a positive correlation between the size of the circle and the occurrence rate of the term. The red cluster, for example, contains keywords such as animation, education, impact and children, indicating a focus on the impact of using animation in children's learning. The green cluster includes student, videos, case study, and effectiveness, which emphasizes the effectiveness of animation in case studies of learner learning. Meanwhile, the purple cluster, which contains words such as development, evaluation, and design, emphasizes the development and evaluation aspects of the media.

However, there are no keywords that explicitly lead to problem-solving or comparison, which indicates a research gap in the utilization of video animation to improve mathematics problem-solving skills, especially in comparison materials. Based on these findings, there is an opportunity for novelty that can be developed, namely designing interactive animated videos based on problem solving to help students understand the concept of comparison in a mathematical context. This approach can enrich the literature as well as provide innovative contributions in the development of learning media that are more applicable and contextual. The overlay visualization results can be seen in Figure 4.

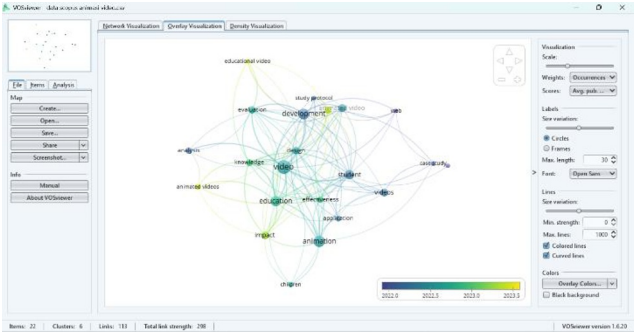

Fig. 4. VosViewer Overlay Visualization Results

Based on the results of VOSviewer's Overlay Visualization of video animation-themed publications, it can be seen that research in this field is dominated by keywords such as video, animation, education, student, and development. The colors in the visualization show the distribution of publication time, where blue represents topics that have been previously researched in 2022, while green to yellow indicate relatively newer topics and developed in 2023 and above. Some keywords such as development, impact, and evaluation began to show a greenish color indicating an increasing trend of interest in recent years, especially in the development and evaluation of animation media. However, there are no keywords directly related to problem-solving or comparison,

either as the main keyword or in relation to other keywords. This suggests a research gap in the use of video animation to develop problem-solving skills, particularly in the context of mathematical comparison.

Therefore, this opens up opportunities for new research that focuses on developing problem-solving-based interactive animated videos on the topic of comparison. The media is expected to not only be able to visualize mathematical concepts dynamically, but also encourage students to think critically through real-life contexts, such as price, distance or time comparisons. Thus, this kind of research can make a significant contribution in integrating technology and mathematical thinking strategies in a more applicable and contextual way. Then for the results of density visualization can be seen in Figure 5.

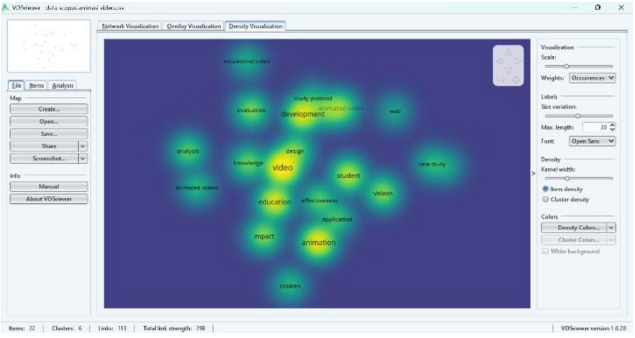

Fig. 5. VosViewer Density Visualization Results

Based on the Density Visualization results from VOSviewer related to video animation topics, it appears that the keywords video, education, animation, student, and development appear with high density, marked with a bright yellow color. This indicates that these topics are at the center of attention in the scientific literature and have been widely researched. However, there are no keywords explicitly related to problem-solving or comparison, which suggests that the topic of problem-solving skills in the context of comparison is still not significantly covered in the literature using video animation media.

This reflects a new research opportunity to develop animated video media that is not only informative, but also explorative and applicable, such as inviting students to solve comparison problems visually and contextually. Given the high density of the words education, student, and animation, research that combines these three elements in the context of mathematical problem-solving has the potential to make relevant and innovative contributions. Thus, this visualization reinforces the urgency and potential of new research integrating video animation with problem-solving approaches in mathematics learning, particularly on the topic of comparison.

4 Conclusion

Based on Network Visualization, Overlay Visualization, and Density Visualization analysis of scientific publication data related to video animation, it was found that the focus of current research still revolves around general topics such as video, education, animation, students, and development. The red cluster highlights the interrelationship between animation, impact, education, and children, which shows the relevance of animation in children's education, but has not explicitly led to problem-solving skills.

From the Overlay Visualization, it can be seen that some topics such as student, application, and effectiveness are rising in recent publications (2023 and above), but there is still no strong exploration of the use of video animation to build problem-solving skills, especially in the context of mathematical materials such as comparison.

Meanwhile, Density Visualization reinforces the finding that there is no high density yet that shows a strong integration between video animation and problem-solving approaches in comparison. This opens up gaps and opportunities to develop new research that is more specific and innovative.

Thus, it can be concluded that the integration of video animation in mathematics learning, especially to improve problem solving skills in comparison is still a very potential area to be developed. Research in this area will not only expand scientific contributions, but also have a great opportunity to answer the needs of innovation in visual-based digital education.

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