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## THE UTILIZATION OF VIDEOS AS LEARNING MEDIA IN MATHEMATICS LEARNING: A SYSTEMATIC LITERATURE REVIEW

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### Abstract

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Learning media play a role in improving students' understanding of mathematics, one of which is through the use of videos. This study aims to describe the development of research on learning videos over the last 10 years, the topics most frequently applied in learning videos, the regions that widely implement and conduct research on learning videos, the types of learning media used, as well as the utilization of videos as a learning medium in mathematics education. This study employs a Systematic Literature Review (SLR) approach, with the search process conducted on Google Scholar and Semantic Scholar using relevant keywords. Data collection was carried out using Covidence, after which articles that met the criteria were quality-assessed, and the extracted data were analyzed qualitatively. The results show an increase in the use of videos as a medium for mathematics learning since 2018, particularly in Indonesia, especially in the East Java region. Videos are used in various forms and platforms such as YouTube, Google Classroom, and WhatsApp, covering a wide range of mathematical topics. The main objectives are to improve conceptual understanding, learning outcomes, and students' critical thinking skills, as well as to support more inclusive and flexible learning, particularly for students with special needs.

**Keywords:** Systematic Literature Review; Video-Based Learning; Learning Media

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### INTRODUCTION

Learning media is very important in improving students' understanding of mathematical concepts. Improving the quality of learning needs to be carried out through changes, improvements, and innovations in the use of learning media (Anwar et al., 2020). In a learning context that is increasingly dependent on technology, learning media such as interactive videos, educational games, and Android-based applications can help bridge the gap between abstract concepts and student understanding. It is stated that one of the things teachers can do is to make learning enjoyable and increase students' motivation by adapting learning to students' characteristics, time, material, and the effective use of media (Rachmavita, 2020). Research shows that the appropriate use of learning media can make complex mathematics material easier to understand and more interesting for students (Fitriya & Faizah, 2021; Sudianto, 2021).

Technological innovation in education improves the quality of teaching and self-directed learning by providing various mechanisms, such as virtual platforms and web

pages, which have a high academic impact (Widayati & Hendroanto, 2022). However, challenges in mathematics learning remain, particularly regarding concept abstraction and low learning motivation. Many students experience difficulties in understanding abstract mathematical concepts, which often lead to frustration and decreased motivation (Al-Hamzah & Awalludin, 2021; Yulia et al., 2021). Mathematics is a universal science, forming the foundation of today's technological development, playing an important role in various disciplines, and enhancing human capabilities (Rachmavita, 2020). A deep understanding of mathematics enables one to solve problems more effectively (Juandi, 2021). This has been further exacerbated by online learning during the pandemic, which has made students less active and less engaged in the learning process.

In facing these challenges, the use of innovative learning media such as educational applications and animated videos provides opportunities to create a more interactive and engaging learning experience, which in turn can improve mathematics achievement and have a positive impact on students' attitudes, perceptions, and overall learning experiences (Huang et al., 2020). Video-based learning media has significant potential in presenting learning materials to students in a visual and dynamic manner (Rachmavita, 2020). Learning videos are media that can accommodate learning content more attractively and present it more realistically so that students can understand the lessons better and in depth (Kusmaryono & Basir, 2024). Videos have an interactive nature that allows students to actively engage in the learning process by answering questions, expressing opinions, or participating in provided simulations. The flexibility of videos enables students to learn anytime and anywhere, review material as needed, and deepen their understanding—an essential aspect of mathematics learning (Telaumbanua, 2023). However, the dynamic visualization in animated mathematics videos can enhance mathematics learning but may also hinder it if not aligned with clear learning objectives (Bos & Wigmans, 2025).

Video-based learning also facilitates students' understanding of abstract mathematical concepts by providing a more interactive and engaging approach compared to conventional teaching methods. Based on the findings of Majid et al., (2025), learning videos were found to be effective in improving students' mathematical literacy skills by 91.25%. This is in line with Prastica et al., (2021), who stated that students who learned through videos achieved better results than those using traditional methods. Similarly, Arifin et al., (2021) emphasized that videos can enhance students' motivation, comprehension, and engagement in mathematics learning within the Flipped Classroom model. Furthermore, videos also help students improve their understanding and retention of material (Pamungkas et al., 2022). Nasrullah et al., (2023) also found that GeoGebra learning videos effectively improved students' mathematical communication skills. Interactive video-based PowerPoint media is effective in implementing mathematics learning, with an average score of 70.29 for learning outcomes (Anwar et al., 2020).

In recent years, video has become one of the most widely used learning media, as it presents information visually, thereby making it easier for students to understand abstract and complex mathematical concepts. In secondary schools with certain learning disabilities, video learning media significantly improved problem-solving skills (Kellems et al., 2020). Videos also provide students with opportunities to learn at their own pace, which is particularly important in inclusive education contexts (Noetel et al., 2021). Haryanti (2022) found that learning videos can increase students' engagement and interest in mathematics by using animated videos on the topic of congruence. Similarly, Apriadi (2021) demonstrated that animated mathematics videos delivered through Android-based applications can improve students' contextual understanding of trigonometric concepts. Learning videos can integrate various methods and enhance

learning outcomes through platforms such as YouTube and online learning services (Nurdin et al., 2019). These platforms can help address the issue of limited resources in schools that may lack adequate learning facilities (Costa & Borges, 2023).

Mathematics learning is often perceived as difficult and challenging. Students struggle to understand fundamental mathematical concepts due to cognitive barriers and a lack of conceptual understanding (Priscila et al., 2019). In addition, students often face difficulties in formulating mathematical models in word problems, including errors in constructing equations and diagrams, which highlights the importance of the mathematization process in algebra learning (Jupri & Drijvers, 2016). In addressing these challenges, visualization can help students understand abstract mathematical concepts. By knowing the effectiveness and how to use videos, educators can design learning materials that are more interesting and meet student needs, increasing student motivation and learning outcomes. Based on this background, this study aims to provide a complete and up-to-date explanation of using video as a learning medium for mathematics, consisting of how research has developed in the last 10 years and materials often applied to learning videos. These areas often apply to learning videos and media used, and then the main focus is on utilizing video as a learning medium in mathematics learning. Based on these objectives, the research questions raised are:

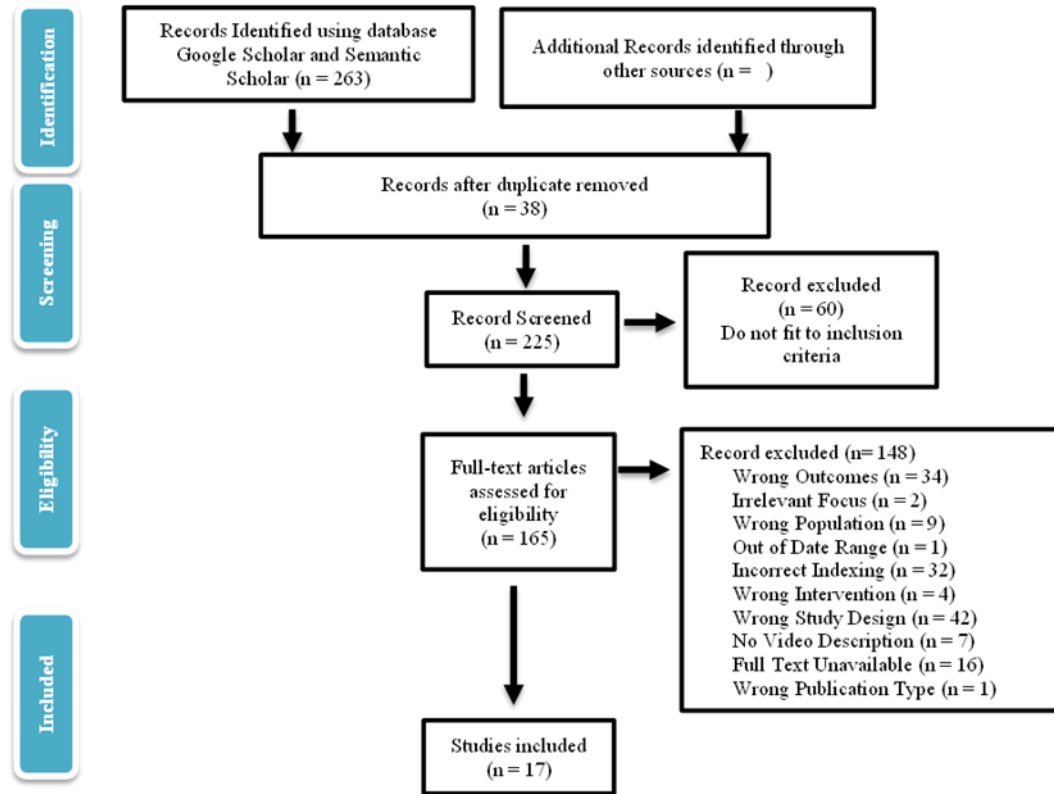
1. How has research on using video as a medium for learning mathematics developed in the last 10 years?
2. Which region or country most often uses video as a medium for learning mathematics?
3. How is video utilized in mathematics learning regarding video types, media used, and the subject matter?

## **METHODS**

This research uses the Systematic Literature Review (SLR) method. Systematic Literature Review (SLR) is a research method that uses a systematic and replicable approach to identify, evaluate, and synthesize all relevant evidence related to a particular research question. Articles are obtained by browsing research results using a search engine. This SLR research was conducted using phenomenological methods: identifying, collecting data, identifying meaningful statements, giving meaning, and creating thick and rich descriptions. Researchers collected journal articles on Google Scholar and Semantic Scholar databases to complete this research. The population in this study is all research on learning videos published in indexed journals 1 to 4 and Scopus. The keywords are learning video media, educational video, instructional video, and math or math learning.

The inclusion criteria in this SLR are: (1) The article is peer-reviewed research on video utilization in mathematics learning; (2) The article was published from 2014 to 2024 in both Indonesian and English; (3) The article covers research at various levels of education (elementary, junior high, high school, or college); (4) The article uses empirical research methodologies such as quantitative, qualitative, mixed-method, case study, or experiment; (5) Articles discuss the effectiveness, impact, and implementation strategies of videos in mathematics learning; (6) Articles have a transparent methodology, valid and reliable instruments, and comprehensive data analysis; (7) Articles come from various countries and specifically Indonesia covers various regions; (8) Articles are indexed by Sinta (1-4) and Scopus; and (9) Articles can be accessed in full-text.

Data collection was conducted using Covidence to conduct a Systematic Literature Review (SLR) process, following the steps in the PRISMA protocol, which includes three main phases: Identification, Screening, and Included. This protocol ensures that the review is conducted systematically and transparently. The data collection process is presented in Figure 1



**Figure 1.**  
 Search strategy using PRISMA  
 Source: Reseachrher

## RESULTS & DISCUSSION

### Results

Based on a literature search on Google Scholar and Semantic Scholar databases using the keywords "(learning video OR video media OR educational video OR instructional video) AND (mathematics OR mathematics education OR learning mathematics)," 263 articles were found that had been filtered based on indexation and publication year. However, after identifying duplicate articles using Covidence and manually, 38 duplicate articles were found, so the number of valid articles remained at 225. Furthermore, the articles were filtered using the inclusion and exclusion criteria, resulting in 17 relevant articles. The researcher then analyzed the 17 articles to answer the research questions that had been formulated previously. The research data and indexation of each article included in this literature review can be seen in Table 1.

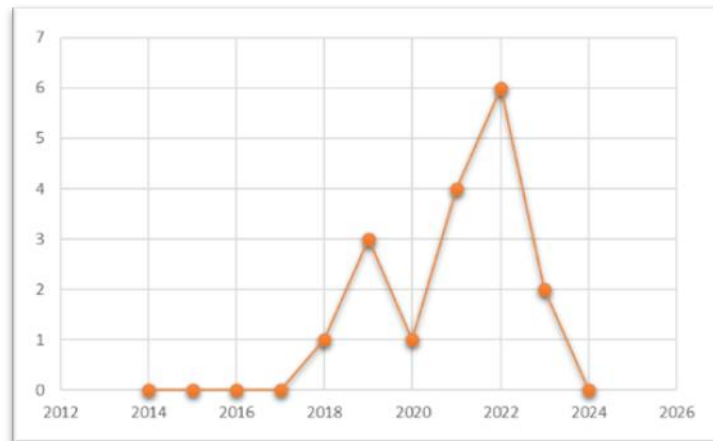
**Table 1.**  
 Research Data

<b>Title</b>	<b>Year</b>	<b>Subjek</b>	<b>Research Method</b>	<b>Indexing</b>	<b>Article Code</b>
Use of O-Matic Video Screencast in Abstract Algebra Course Understanding Mathematics Concepts through Youtube Media with an Ethnomathematics Approach	2018	Student	Quantitative	Sinta 4	A1
Utilization of Geogebra-Based Learning Video to Improve Mathematical Concept Understanding Ability of Vocational Students	2019	SMA	Quasi Eksperimen	Sinta 4	B1
Point of View Video Modeling to Teach Simplifying Fractions to Middle School Students With Mathematical Learning Disabilities	2019	SMK	Quasi Eksperimen	Sinta 2	B2
The Effectiveness of Digital Storytelling Videos on the Learning Outcomes of Grade X Students on Trigonometry Material	2019	SD	Ekperimen	Q2	B3
Let's See That Again: Using Instructional Videos to Support Asynchronous Mathematical Problem-Solving Instruction for Students With Autism Spectrum Disorder	2020	SMA	Eksperimen	Sinta 3	C1
Exploring The Perceptions of Grade 5 Learners About The Use of Videos and PowerPoint Presentations When Learning Fractions in Mathematics	2021	Specialised basic education (Students with ASD and Moderate intellectual disability)	Eksperimen	Q2	D1
The Effectiveness of Problem-Based Learning Model Assisted by Video in Liveworksheets on Students' Mathematical Problem-Solving Ability Description of	2021	SD	Qualitative	Sinta 3	D2
	2021	SMK	Quasi Eksperimen	Sinta 3	D3
	2021	SMK	Qualitative	Sinta 2	D4

Mathematics Learning with Geogebra Video and Students' Mathematical Understanding of Quadratic Function Material						
Learning Mathematics Through Videos Lines and Angles: How to Analyze Students' Understanding of Mathematical Concepts?	2022	SMP	Qualitative	Sinta 2	E1	
Test the Effectiveness of Mathematics Learning Media Based on Powtoon Animation Video in Junior High School on Two-Variable Linear Equation System Material	2022	SMP	Ekperiment	Sinta 4	E2	
Improving Students' Mathematics Learning Achievement in Video-Based Distance Learning Video-assisted	2022	SMA	Classroom action research	Sinta 3	E3	
Mathematics Learning to Improve Students' Motivation and Learning Outcomes	2022	Mahasiswa	Quantitative	Sinta 3	E4	
Application of the Discovery Learning Model Assisted by Learning Video to Improve Learning Outcomes	2022	SMK	Classroom action research	Sinta 2	E5	
A Technology-enhanced learning Intervention for Statistics in Higher Education Using Bite-Sized Video-Based Learning and Precision Teaching	2023	SMK	Eksperiment	Sinta 3	E6	
Application of Video-Based Learning System for Junior High School Students on Algebraic Expression Materials	2024	Mahasiswa	Mix Method	Q1	F1	

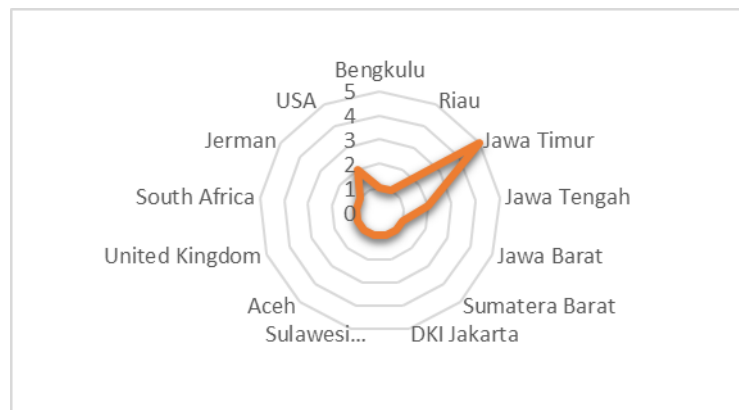
*Source: Researcher*

The distribution of research articles throughout the years shows the development of research interest in video utilization in mathematics learning. Figure 2 illustrates the number of articles published from 2014 to 2024.



**Figure 2.**  
Article Distribution from 2014-2024  
*Source: Researcher*

The graph indicates that between 2012 and 2017, there were no publications on the use of video in mathematics education, suggesting minimal research interest during that timeframe. An upward trend began in 2018, reaching a peak of six publications in 2022. This increase symbolizes a rising fascination with the subject, especially following the COVID-19 pandemic, which prompted the adoption of technology in education. While the number of publications dropped after 2022, the overall trend still suggests that video usage continues to be a significant and worthwhile area for further exploration.



**Figure 3.**  
Distribution of Use of Learning Videos  
*Source: Researcher*

As illustrated in Figure 3, East Java stands out with five studies focusing on instructional videos, highlighting its leading role in the creation of video-based mathematics learning resources. In contrast, regions like Riau and Bengkulu have made fewer contributions, while many other areas, including countries like the USA and South Africa, each documented only one study. This implies that the use of instructional videos varies significantly across different locations, suggesting a chance to broaden research efforts into additional regions to foster more equitable educational advancements.

The characteristics of each article, which have been coded in Table 2, include the type of media used to present the videos, the subject matter covered, and their application in mathematics learning.

**Table 2.**  
 Characteristics of the research data

Article Code	Type of Video	Media	Content	Video Utilization
A1	Tutorial video	Screencast O-Matic	Abstract Algebra	Enhancing students' learning activity and academic achievement
B1	YouTube-Based Learning	Corel Videostudio X10	Realistic Mathematics Education	Improving students' conceptual understanding and problem-solving skills
B2	GeoGebra-Based Instructional Video	Computer, projector, and sound system	Transformational Geometry	Enhancing students' conceptual understanding
B3	Point of View Video Modeling	Not explicitly specified, but used in classroom settings	Fractions	Improving conceptual understanding of students with mathematics learning disabilities (MLD)
C1	Digital Storytelling Video	Packaged as a single CD	Trigonometri	Improving student learning outcomes
D1	Video-Based Instruction	SeeSaw and Loom	Multiplicative comparison word problems (including referent, scalar, and compared value)	Improving mathematics learning outcomes for students with special needs
D2	Instructional Video	Powerpoint	Fraction	Providing an engaging and enjoyable learning experience
D3	Video in Online Worksheet (LKPD)	Liveworksheets	Arithmetic Sequences	Enhancing problem-solving skills
D4	Instructional Video supported by GeoGebra	Youtube	Quadratic Functions	Enhancing the mathematics learning process using GeoGebra video media
E1	Instructional Videos	Youtube	Lines and Angles	Improving conceptual understanding
E2	Animated Video	Powtoon	Two-Variable Linear Equation System.	Animated video using Powtoon is more effective than lecture-based instruction in mathematics learning
E3	Instructional	Google	Statistics	Enhancing students'

	Video	classroom		academic performance
E4	Self-designed audiovisual recording with animation (OBS-based)	Google classroom dan Zoom	Calculus	The use of video in a virtual flipped classroom enhances students' critical mathematical thinking skills
E5	Instructional Video	Shared via WhatsApp	Trigonometry	Improving student learning outcomes
E6	Instructional Video	Google Meet	Arithmetic Sequences	Enhancing mathematics learning outcomes
F1	Bite-sized Video-Based Learning	Powerpoint	Statistics	Demonstrating the potential of video-based learning to improve student engagement and performance in statistics
F2	Video-Based Learning System	Not explicitly specified, but used in classroom settings	Algebra	Enhancing student understanding, encouraging active interaction, and strengthening the teacher's role as facilitator

*Source: Researcher*

In learning mathematics, different types of videos are used to support the teaching and learning process. Based on the data reviewed, the most widely used type of video is learning videos, which appear in various formats and platforms (e.g., Google Classroom, WhatsApp, and Google Meet). Other types of videos include tutorial videos (A1), Geogebra-based videos (B2, D4), digital storytelling (C1), animation-based videos (E2), and bite-sized video-based learning (F1). There is even the use of a flipped classroom model based on audio-visual recordings (E4) and point of view video modelling (B3) specifically for students with mathematics learning difficulties. This shows that the use of video in mathematics learning is highly varied and contextualised, depending on the learning objectives and needs.

The media or platforms used to produce and display videos also vary. Some articles used specialised software such as Screencast O-Matic (A1), Corel Videostudio X10 (B1), and Powtoon (E2), while others utilised popular platforms such as YouTube, Google Classroom, and Zoom. Others saved the videos on CDs (C1) or shared them via WhatsApp (E5). This shows that the success of video utilisation depends not only on its content, but also on the accessibility and ease of distribution of the medium to learners.

In terms of materials taught, the use of videos covers a wide range of mathematical topics such as algebra (A1, F2), transformation geometry (B2), quadratic functions (D4), trigonometry (C1, E5), arithmetic sequence (D3, E6), statistics (E3, F1), to abstract materials such as calculus (E4) and multiplicative comparison (D1). This variation shows that videos can be applied to almost all mathematics topics, both conceptual and procedural. In terms of the purpose and utilisation of videos, almost all articles indicate

that videos are used to improve learning outcomes (A1, C1, E3, E5, E6), understanding of mathematical concepts (B1, B2, B3, D1, E1, F2), and critical thinking (E4) and problem-solving skills (B1, D3). Some studies also emphasise a more fun and engaging learning experience (D2), as well as increased student engagement (F1) and the teacher's role as facilitator (F2). This suggests that video is not only a visual aid, but also a pedagogical strategy capable of enriching learning.

The data shows that videos in mathematics learning have great potential to improve the quality of learning. The diversity of video types, media used, material coverage, and learning objectives confirms that video integration must be tailored to the context and needs of learners to achieve optimal results. In addition, appropriate use of videos can help bridge the learning gap, especially for students with special needs or learning difficulties.

### ***Discussion***

The utilisation of learning videos has not been evenly distributed geographically, so it needs to be expanded to other regions to encourage more equitable educational innovation. This equitable effort is important so that all regions have equal opportunities to access digital learning media that can improve the quality of mathematics learning. This is supported by Putu et al., (2021) that videos will be able to provide a real picture to students. Video media can provoke learning to be more lively because it will raise the curiosity of students. Then learning that is suitable for the current situation is one of them in the form of video, because video can summarise many events over a long time into be shorter and clearer accompanied by images and sounds that can be repeated in the process of use (Setiani et al., 2022).

The use of videos in learning mathematics is very diverse in terms of type, media, material, and purpose of use. The most dominant type of video is learning videos in various formats and popular platforms such as Google Classroom, WhatsApp, and Google Meet, but other types such as video tutorials, Geogebra-based videos, animated videos, digital storytelling, and flipped classroom models are also used according to learning needs. This diversity shows that video is not only a visual medium, but also a flexible and contextualised pedagogical strategy to support various learning objectives. The increasing number of learning media means that the skills in choosing them are also increasingly important, therefore, the use of video learning resources must follow the subject matter being taught (Darwata & Handican, 2023) Video learning resources can be used to improve concept understanding, learning outcomes, critical thinking skills, and student engagement. The media or platforms used are also very diverse, ranging from specialised production software such as Screencast O-Matic and Powtoon, to easily accessible distribution platforms such as YouTube and WhatsApp, which underlines the importance of accessibility and ease of distribution in the effectiveness of video use. This is in line with (Trisanti et al., 2021) that the selection of video as a medium for disseminating innovations, apart from being able to combine visuals with audio, can also be packaged in various forms, for example, combining face-to-face communication with group communication, using text, audio, and music. In addition, learning videos make it easier for teachers to convey learning content and help students understand the context of the subject matter (Ahmad et al., 2024). The mathematics material taught through videos covers a wide range of topics, ranging from algebra, geometry, trigonometry, statistics, to advanced material such as calculus and multiplicative comparison, showing that videos can be applied to a variety of mathematical concepts, both procedural and conceptual. By

combining audio and visual elements, video-based learning media has great potential for students to better understand mathematics concepts.

The use of video has been proven to enrich the learning experience, create a more interesting atmosphere, and increase the role of the teacher as a facilitator who supports active interaction. Thus, video has great potential as an effective learning media if its use is tailored to the context and needs of learners, including bridging the learning gap, especially for students with special needs or mathematics learning difficulties.

## CONCLUSION

This study revealed the development, geographical distribution, and characteristics of video utilisation as a medium for learning mathematics. Based on the review of relevant articles, it was found that; First, research on the use of video in mathematics learning shows an increasing trend, especially since 2018, and reaches its peak in 2022. This increase is driven by the increased demand for online learning after the COVID-19 pandemic. Although after 2022, there is a slight decline in the number of publications, interest in this topic remains high and shows potential for continued research. Secondly, geographically, the dominance of the use of learning videos is seen in the region of East Java, Indonesia, with the highest number of publications. Some other regions, such as Riau and Bengkulu, show smaller contributions, and most other countries have only one publication. This finding suggests that the utilisation of videos in mathematics learning is uneven globally, providing opportunities for further research in less explored areas. Thirdly, videos in mathematics learning are used in various forms, including learning videos, video tutorials, digital storytelling, animation, and flipped classroom approaches. The platforms and media used to display videos are also very diverse, ranging from YouTube, Google Classroom, Zoom, to simple media such as WhatsApp and CDs. The material delivered through videos covers almost all domains of mathematics, both conceptual and procedural, such as algebra, trigonometry, calculus, geometry, and statistics. In terms of objectives, videos are used to improve learning outcomes, concept understanding, critical thinking, and problem-solving skills, as well as to strengthen the teacher's role as a facilitator and create a more enjoyable and interesting learning experience. Some videos are specifically designed to support students with special needs.

Overall, the results of this study confirm that video is a flexible, inclusive, and potentially learning medium to improve the quality of mathematics learning. To achieve optimal effectiveness, the integration of video in learning needs to be adjusted to the needs of learners, the characteristics of the material, and the accessibility of technology in each learning context.

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