

## VIDEO-BASED LEARNING IN SCIENCE EDUCATION: A SYSTEMATIC LITERATURE REVIEW AND BIBLIOMETRIC ANALYSIS

Aulia Annisa Himmatul Bilqist<sup>1</sup>, Ani Rusilowati<sup>1</sup>, dan Ellianawati<sup>1</sup>

<sup>1</sup>Department of Physics, Universitas Negeri Semarang, Indonesia

Corresponding author email: [auliaannisa20@students.unnes.ac.id](mailto:auliaannisa20@students.unnes.ac.id)

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### Abstract :

The rapid development of digital technology has expanded the use of videos and vlogs as learning media across science education, particularly in Environmental Science, Physics, and Mathematics. This study aims to systematically examine global research trends, intellectual structures, and thematic developments related to learning videos and vlogs through a Systematic Literature Review (SLR) combined with bibliometric analysis. Data were collected from the Scopus database using the keywords “learning” and “video/vlog” covering publications from 2015 to 2025. Article selection followed the PRISMA protocol, resulting in 657 eligible articles for analysis. Bibliometric mapping was conducted using VOSviewer and Biblioshiny to analyze collaboration networks, keyword co-occurrence, and thematic evolution. The findings identify learning and video recording as Motor Themes with the highest centrality and density, confirming the central role of video-based media in technology-supported learning and highlighting Multimedia Learning Theory as the dominant theoretical foundation. The results also indicate an emerging shift toward participatory and contextual learning vlog approaches. Unlike previous studies focusing on instructional effectiveness, this study provides a comprehensive bibliometric synthesis revealing the global research trajectory. The analysis demonstrates limited integration of ethnoscience perspectives and analogy strategies within the dominant landscape, positioning ethnoscience-based learning vlogs as a promising direction for developing contextual and culturally responsive physics and science learning.

Keywords: Systematic Literature Review, Learning Video, Bibliometric Analysis

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## INTRODUCTION

The development of digital technology has given rise to a variety of new learning media, one of which is videos and vlogs, which are now widely used in various disciplines. Since the increase in the need for online learning after the pandemic, the use of learning videos has expanded significantly, both as a primary learning resource, a learning companion, and a concept evaluation tool (Noetel *et*

*al.*, 2021). Video is considered capable of bridging the gap between abstract representation and concrete learning experiences, particularly in the fields of Physics and Mathematics, which require visualization of phenomena and conceptual structures (Brame, 2016). Online videos encourage students to engage more actively by placing them as the main subjects of learning through independent viewing activities, interacting with video content, and reflecting on their understanding before face-to-face classes (Fathil *et al.*, 2016).

In the context of science education, videos not only serve as a medium for presenting material, but also as a means of building conceptual understanding through simulations, demonstrations, and scientific narratives linked to real phenomena. Various studies show that presenting information in audiovisual form can improve retention, reduce cognitive load, and strengthen student motivation to learn (Kay, 2012). Video is also used as a means of reflection and analysis of the learning process through the use of video recordings that allow for re-observation of the learning process (Santagata *et al.*, 2021).

The use of video in online learning during the COVID-19 pandemic has been further strengthened by its integration into Learning Management Systems and video conferencing platforms. Acceptance of this technology is influenced by ease of use, perceived usefulness, and the quality of the video content presented (Hassan, 2022). More personal and narrative video formats, including educational vlogs, are considered capable of increasing students' social presence and emotional engagement (Zhang *et al.*, 2020).

A number of previous Systematic Literature Reviews (SLR) have examined the use of educational videos in science, technology, engineering, and mathematics (STEM). Kertamuda *et al.* (2024) reviewed the use of educational videos assisted by the InShot application, while Khairani dan Lestari (2025) evaluated the development of Video Learning Materials (VMB) in improving conceptual understanding. However, these studies still focus on the aspects of media development and effectiveness, without mapping the thematic structure, publication trends, and conceptual relationships of research bibliometrically. In addition, the discussion of learning vlogs and their relationship with ethnoscience-based contextual approaches and analogies is still not a major focus.

Although various research studies and Systematic Literature Reviews have examined the effectiveness and development of learning videos, most studies are still oriented toward media implementation and learning outcomes, rather than comprehensively mapping the intellectual structure or thematic development of the research field. Previous SLR studies also rarely integrate bibliometric analysis to uncover conceptual relationships, patterns of scientific collaboration, and the dynamics of research development over time. The integration of ethnoscience perspectives and analogy approaches in the context of learning videos or vlogs has not yet become a primary focus in global research. This condition indicates a research gap in the form of the unavailability of a systematic scientific mapping to identify the direction of video learning research development, as well as opportunities for developing culturally-based contextual approaches in science education.

Therefore, this research contributes by (1) mapping global research trends related to learning videos and vlogs thru bibliometric analysis, (2) identifying the dominant thematic structure and theoretical foundations in the field, and (3) revealing opportunities for developing learning vlogs based on ethnoscience and analogy as a direction for more contextual science learning innovation. To achieve these objectives, this research combines PRISMA guidelines with bibliometric analysis using VOSviewer and Biblioshiny to uncover publication trends, thematic patterns, and the conceptual structure of the research.

## **RESEARCH METHOD**

### ***Research Design***

This study employed a Systematic Literature Review (SLR) approach combined with bibliometric analysis to systematically identify, evaluate, and synthesize scientific publications related to learning videos and learning vlogs. This study followed the PRISMA guidelines consisting of identification, screening, eligibility, and inclusion stages as the framework for data selection.

**Research Target/Subject**

The research target consisted of scientific articles indexed in the Scopus database representing global scientific production in science education, particularly Physics, Mathematics, and Environmental Science. The research data collection process was carried out using the Scopus database, which was chosen for its comprehensive indexing and quality of reference sources. The search was conducted using a specific query containing a combination of the keywords learning, vlog, and video, limited to the subjects of Environmental Science, Physics, and Mathematics. The limitation was applied to publications from 2015 to 2025 to reflect the latest trends in the use of educational videos. Furthermore, articles were filtered based on document type (“article”), English language, and open access so that only academically valid publications were analyzed further.

**Research Procedure**

Submitted articles must be journal articles, written in English, open access, published between 2015 and 2025, related to educational videos or vlogs, and in the fields of Physics, Mathematics, or Environmental Science. Non-scientific articles, proceedings, editorials, or articles that are not relevant to the theme are excluded. Unlike experimental studies that involve instrument validation, SLR research does not require validity and reliability testing of instruments. Therefore, data quality was ensured through article screening based on database indexing criteria, document type, publication language, accessibility, and thematic relevance following the PRISMA protocol. This process ensured the credibility and consistency of the analyzed data source.

**Instruments, and Data Collection Techniques**

The initial search yielded 129,343 documents, which were then narrowed down based on year, field of study, document type, language, and specific keywords, leaving 657 articles that were truly relevant.

Table 1. Research document screening process

No.	Filtering aspects	Number of documents
1.	Initial keywords (Learning vlog OR Learning video)	129,343
2.	Publication year (2015–2025)	106,362
3.	Subject area (Physics and Astronomy; Enviromental Sciences, Mathematics)	24,494
4.	Document type (Article)	7,691
5.	Language (English)	7,384
6.	All open access	4,282
7.	Keyword (Learning, E-learning, Teaching, Students, Education, Video)	657

**Data Analysis Technique**

Data analysis was conducted through keyword co-occurrence analysis, author collaboration mapping, thematic evolution analysis, and strategic diagram interpretation using VOSviewer and Biblioshiny. Centrality and density indicators were used to classify research themes into motor themes, niche themes, emerging themes, and basic themes.

In this study, bibliometric analysis was conducted using two main tools, namely VOSviewer and Biblioshiny, each of which has a complementary role in mapping the structure of scientific knowledge. VOSviewer is used to visualize various bibliometric relationships such as author collaboration networks (co-authorship), keyword co-occurrence, document citation relationships (co-citation), and inter-institutional collaboration. This tool is specifically designed to build large-scale bibliometric maps with easy-to-interpret visual displays and has been proven effective in interdisciplinary scientific research (Van Eck & Waltman, 2010). Through VOSviewer, this study can identify active author clusters, reveal the conceptual structure of the field of study through the emergence of dominant keywords, and examine citation patterns that form the intellectual basis of research related to the use of educational videos and learning vlogs.

In addition, this study also uses Biblioshiny, an interactive module from Bibliometrix that was developed by Aria and Cuccurullo (2017), to conduct advanced bibliometric analysis. Biblioshiny allows researchers to track publication trends over time, enabling them to systematically observe the dynamics of research development between 2015 and 2025. In addition, this tool is used to generate thematic mapping that maps theme clusters based on their density and centrality. These thematic maps help identify basic themes, rapidly developing themes (motor themes), and emerging themes that are still in the early stages of development. Biblioshiny's features enable the analysis of country and journal productivity, allowing for the mapping of global contributions in the field of video learning (Aria & Cuccurullo, 2017).

The combination of VOSviewer and Biblioshiny provides a strong analytical foundation for this SLR. VOSviewer displays data in the form of visual networks that facilitate the exploration of relationships between elements of the literature, while Biblioshiny provides statistical and thematic analyses that enrich the interpretation of the results. Thus, these two tools enable researchers to gain a more holistic understanding of research development patterns, significant scientific contributors, and the direction of thematic evolution related to video media in science education.

## RESULTS AND DISCUSSION

### *Publication Trends*

Figure 1 illustrates the chronological growth of publications. The curve is initially flat in the early years (2015–2017), indicating that research on instructional videos had not yet gained significant attention. However, entering 2018, the curve began to rise in response to the increased use of videos in digital learning environments. A dramatic increase was seen after 2020, coinciding with the shift in learning due to the pandemic, which encouraged the massive use of video media. This trend reflects a paradigm shift in learning towards an audiovisual approach. These findings are in line with various studies showing that video is the most adaptive medium in supporting distance and blended learning due to its flexibility, accessibility, and ability to present complex visual representations yang (Noetel *et al.*, 2021). Recent research highlights the use of video to support virtual experiments (Velentzas *et al.*, 2024), increase learning engagement and feedback (Ataner *et al.*, 2025), manage students' cognitive load (Fan *et al.*, 2024), and analyzing learning behavior in digital environments (Khalil *et al.*, 2024). The dominance of publications in the 2020–2025 range confirms that instructional videos have become a major focus of educational research as an adaptive, flexible, and relevant medium for 21st-century learning needs.

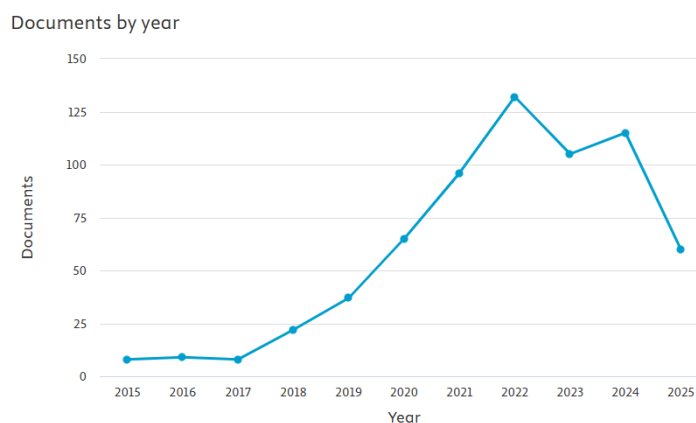


Figure 1. Publication trends

### *Keyword Co-occurrence Mapping*

Figure 2 presents the results of the keyword co-occurrence mapping generated using VOSviewer, a software tool designed to construct scientific network visualizations based on the frequency of keyword occurrences and their interrelationships within a corpus of publications (Van

Eck & Waltman, 2010). In the context of this study, the resulting keyword network represents the conceptual structure of research on learning videos and learning vlogs as reflected in the articles retrieved from the Scopus database.

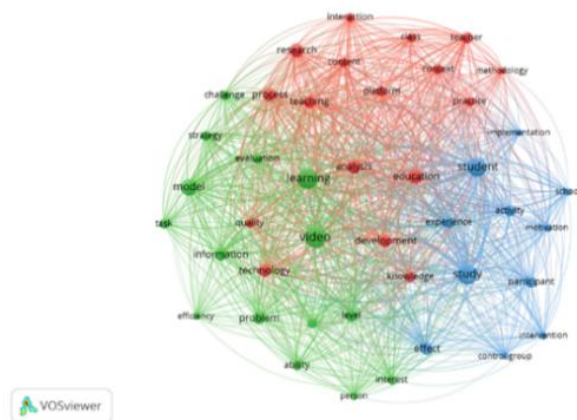


Figure 2. Mapping of concurrent keywords

The keyword co-occurrence map shows three main clusters: red, green, and blue. The red cluster represents teaching and instructional design themes, marked by the keywords teaching, teacher, methodology, content, and platform, which indicate a focus on the use of video as a pedagogical tool and the integration of technology in learning strategies (Abubakar & Muhammed, 2023). The green cluster is the core cluster with the dominant keywords learning and video, as well as related terms such as technology, model, and analysis, which confirms the dominance of research on the effectiveness and design of learning videos in the framework of multimedia learning (Mayer, 2014; Naimah, 2022). These findings are in line with the bibliometric analysis by Muntazhimah (2022) and Muhammad *et al.* (2022), which shows that research on interactive video and multimedia in science learning is dominated by aspects of technology and media effectiveness. The blue cluster focuses on learners and the impact of learning, marked by the keywords student, effect, motivation, and experience, reflecting the large number of empirical and experimental studies on the influence of video on learning outcomes and motivation (Setiawan *et al.*, 2021; Zhang *et al.*, 2025).

The dominance of the keywords video and learning in this mapping is also reinforced by the findings of Marcelle *et al.* (2024) which confirm the role of visual media as a key element in improving conceptual understanding and the effectiveness of multimedia-based learning. However, in the context of science learning, this mapping also reveals important limitations. Although the keywords learning, video, student, and technology dominate as core themes, no keywords were found that explicitly represent the context of local culture, ethnosience approaches, or analogy strategies. These findings contrast with a number of previous studies showing that ethnosience has been widely integrated into science learning through teaching materials, contextual learning models, and practical activities (Jannah *et al.*, 2022; Sari *et al.*, 2023; Wati *et al.*, 2021). Bibliometric studies in the field of ethnosience also confirm the significant contribution of this approach, particularly in physics learning, but its development is still dominated by non-digital approaches (Hidayatullaah *et al.*, 2021; Rahmawati *et al.*, 2025).

Thus, the absence of ethnosience-related terms within the core keyword network of video-based learning research indicates a clear research gap, namely the limited integration of ethnosience approaches into video-based instructional media. This gap highlights strategic opportunities for the development of ethnosience-based learning vlogs and analogical approaches as a means of fostering more contextualized and meaningful science learning that is closely aligned with students' real-life experiences.

### **Overlay Visualization of Keyword Co-occurrence Mapping**

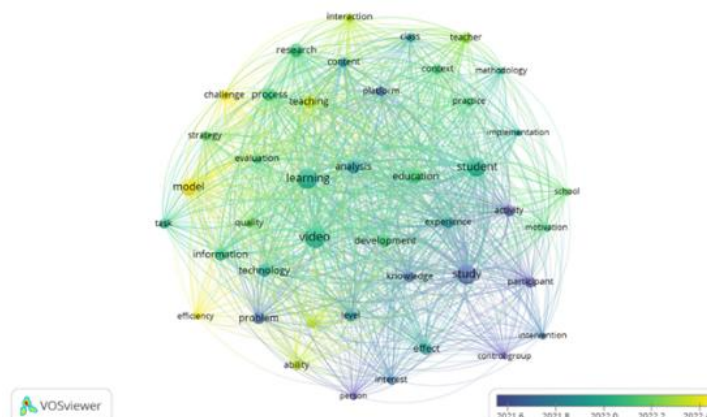


Figure 3. Visualization of keyword overlay correlation

Figure 3 presents the results of the overlay visualization of keyword co-occurrence generated using VOSviewer, illustrating the temporal development of research themes based on the year of publication of key concepts related to learning videos and learning vlogs. Overlay visualization enables researchers to examine shifts in research focus over time, as indicated by a color gradient ranging from blue (earlier publications) to yellow (more recent publications), in accordance with the VOSviewer coloring scheme (Van Eck & Waltman, 2010).

In the visualization, core keywords such as learning, video, student, study, and teaching occupy central positions and are predominantly colored green, indicating that these themes received sustained scholarly attention throughout the 2021–2022 period. The green coloration reflects keywords that consistently appeared during the midpoint of the analysis timeframe and represent foundational themes underpinning research on the use of video-based media in educational contexts.

Keywords such as effect, participant, intervention, control group, and experience are predominantly represented by blue to purple hues. These colors indicate that, during the earlier phase of the analysis period, research primarily focused on evaluating the effects of video-based interventions in learning contexts. Specifically, around 2021, a substantial proportion of studies employed experimental or quasi-experimental designs to examine the impact of instructional videos on learning outcomes and students' motivation. These findings are consistent with earlier work by Zhang *et al* (2006) whose experimental study demonstrated that initial research on learning videos emphasized outcome measurement as a means of assessing the effectiveness of interactive media in e-learning environments.

The keywords learning, video, technology, knowledge, analysis, education, and teaching appear in green. This indicates that in the middle period, research began to move towards exploring video technology as part of the learning model. In this phase, researchers' attention shifted to developing concepts, utilizing technology, and integrating video media into the teaching process and its application in the classroom. This development is in line with the strengthening of Multimedia Learning Theory as the main theoretical foundation that emphasizes the integration of visual and verbal information to support the cognitive processes of learners (Fiorella & Mayer, 2021).

Keywords such as model, strategy, task, challenge, and efficiency are highlighted in yellow, indicating that these themes appear more frequently in publications released closer to 2022–2023. The yellow color spectrum indicates that this research area represents the latest developments, namely research focusing on the development and innovation of video- and vlog-based learning models, the challenges of implementing digital media in the learning process, the efficiency of using video as a learning tool, and pedagogical strategies that optimize video. This pattern is in line with a comprehensive study of video-based learning that reports a shift in research towards learning design, pedagogical strategies, and the optimization of video use (Navarrete *et al.*, 2025).

Thus, this overlay visualization not only confirms the evolutionary trend of learning video research from effectiveness evaluation to pedagogical innovation, but also reveals the limitations of VIDEO-BASED LEARNING IN SCIENCE .... (Aulia Annisa Himmatul Bilqist) pp:97-110



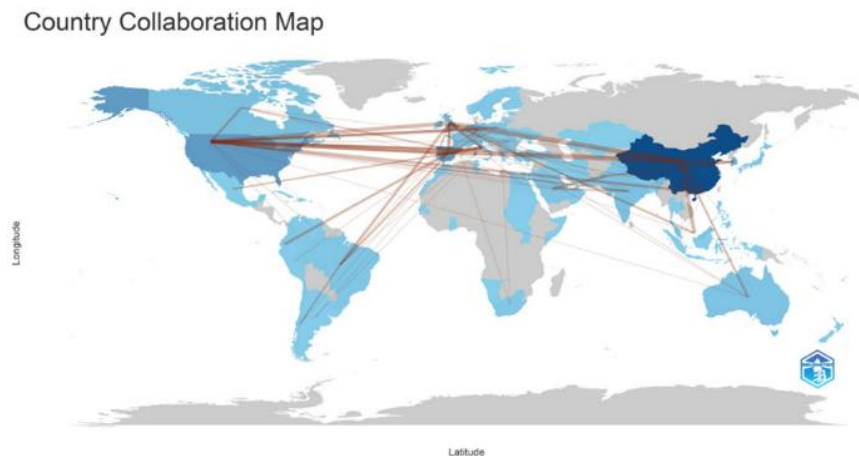


Figure 5. Country collaboration map

The increase in collaboration and productivity of publications was also influenced by the accelerated adoption of e-learning during the COVID-19 pandemic, which encouraged the intensification of research and international cooperation in the field of technology-based learning berbasis (Levidze, 2024). Global bibliometric analysis shows that research on learning videos is dominated by developed countries such as the United States, China, and the United Kingdom, while the contribution of developing countries, particularly in Africa, Southeast Asia, and Latin America, is still relatively limited in terms of both publications and international collaboration (Razilu & Nappu, 2025). This condition is consistent with other educational literature findings that show low research productivity in developing countries compared to developed countries in the field of education and educational technology (Supriandi *et al.*, 2023).

### **Keyword Strategy Map**

Figure 6 visualizes the thematic structure of the literature through a two-dimensional mapping of Relevance Degree (Centrality) and Development Degree (Density), a methodology often used in bibliometric analysis to identify the status and role of research topics (Cobo *et al.*, 2011). The figure shows that learning, video recording, and learning systems are in the Motor Themes quadrant, indicating a mature research focus on video-based learning. This finding is consistent with the results of co-occurrence keyword mapping, which places learning and video as core themes and reinforces Multimedia Learning Theory as the dominant theoretical foundation (Mayer, 2014). The dominance of these keywords is also in line with Nadjla (2025) bibliometric study, which shows that animated video-based learning design is developing rapidly and is directed at improving problem-solving skills. The dominance of technology-based themes in the Motor Themes quadrant indicates that global education research focuses on digital competence and the integration of digital media in learning, in line with the findings of Ma & Ismail (2025), which place digital competence and online learning systems as central themes in education literature.



### **Text Data Visualization**

Figure 8 shows the dominance of the keywords learning, student, human, and videorecording, confirming that video learning research focuses on the learning process and students. These results are consistent with the thematic map that places learning and videorecording as Motor Themes, indicating high relevance and density in the development of video-based learning (Cobo, *et al.*, 2011). This dominance also reinforces the role of Multimedia Learning Theory as the main foundation in video design and evaluation (Mayer, 2014).



Figure 8. Word cloud

This orientation towards students is supported by various studies showing that videos and virtual laboratories can facilitate effective understanding of scientific concepts, comparable to or even surpassing conventional learning, especially in visualizing abstract concepts and experimental processes (Husnaini & Chen, 2019; Noorhidawati *et al.*, 2015; Reeves & Crippen, 2021). The dominance of the keywords learning, student, and videorecording in the text data visualization confirms that learning video research is strongly oriented towards improving students' conceptual understanding and learning experiences. These findings are in line with various studies showing that visual and digital media are effective in visualizing complex concepts, increasing engagement, and supporting student-centered learning, whether in the context of science, health, or skills-based learning (Chang, 2021; De Ambrosis *et al.*, 2015; Kim & Lee, 2021; Wei *et al.*, 2021).

The emergence of the keywords human and student indicates a research orientation centered on student learning experiences, while the position of e-learning and teaching as developing themes indicates the need for a more contextual digital approach. The visualization analysis of the three fields shows the connection between pedagogical and technological approaches, indicating that the study of video vlogs is not only in the realm of education but also related to the development of technology-based analysis methods (Gupta & Madhukar, 2020). Overall, these bibliometric findings support that the development of ethnoscience and analogy-based learning vlog videos is a relevant and strategic research direction in the development of technology-based learning.

The findings of this study reinforce the position of Multimedia Learning Theory as a dominant paradigm in instructional video research. The strong emphasis on technological perspectives, however, reveals limitations in accommodating contextual and cultural dimensions within science learning. The absence of ethnoscience-related themes indicates that current research remains largely oriented toward technological advancement rather than toward learning approaches that are responsive to students' cultural contexts. The results highlight the importance of developing instructional videos and learning vlogs that extend beyond multimedia design considerations by integrating local cultural contexts and analogy-based approaches. Such integration has the potential to support more meaningful and contextualized understanding of scientific concepts and to enhance learners' engagement with science learning in authentic environments.

This study is subject to several limitations. First, the analysis was confined to publications indexed in the Scopus database and restricted to English-language and open-access articles, which may have resulted in the exclusion of potentially relevant studies published in other databases or languages. Second, bibliometric analysis primarily examines publication patterns and the structural

*VIDEO-BASED LEARNING IN SCIENCE .... (Aulia Annisa Himmatul Bilqist) pp:97-110*

development of research fields. Therefore, it does not directly evaluate the pedagogical effectiveness of instructional video implementation in actual learning practices.

## CONCLUSION

The results of the Systematic Literature Review show that research on educational videos and vlogs in the fields of Environmental Science, Physics, and Mathematics has increased significantly, with educational videos being the most dominant medium and educational vlogs beginning to develop as a more participatory and contextual form of media. Thematic mapping places learning and video recording as Motor Themes, which confirms the central position of video in the development of technology-based learning with Multimedia Learning Theory as the main theoretical basis. These findings indicate further development opportunities in the use of educational vlog videos that integrate ethnoscience and analogy approaches to strengthen the connection between abstract concepts and real contexts. Furthermore, future research directions need to consider learning video designs that are more adaptive to learner characteristics and aligned with developments in digital learning.

Future studies are recommended to develop and empirically examine ethnoscience and analogy based learning vlog models in order to investigate their effectiveness in improving conceptual understanding and contextual learning experiences across different levels of education.

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