APPROACHES TO THE PEDAGOGICAL EFFECTIVENESS OF EDUCATIONAL VIDEOS

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Abstract

The rapid digital transformation of higher education has elevated educational videos to a central role in teaching and learning processes. This paper examines the pedagogical effectiveness of educational videos by analyzing their genre characteristics, methodological applications, and evidence-based design principles. Drawing on international and Hungarian literature, the study categorizes major video types used in higher education, including lecture capture, animated, hybrid, demonstration, interactive, and live-streamed formats, highlighting their distinct instructional functions and pedagogical affordances.

The analysis demonstrates that educational videos enhance learning effectiveness when they combine visual and verbal information, thereby reducing cognitive load and supporting deeper comprehension. Key effectiveness factors include multimedia design aligned with learning objectives, optimal video length and segmentation, interactivity that promotes active engagement, and the use of visual elements to clarify complex concepts. Instructor presence and communication style are also identified as crucial elements influencing student motivation and engagement. Furthermore, videos that balance theoretical explanations with practical examples foster greater interest and improved learning outcomes.

Educational videos support flexible, self-paced learning and accommodate diverse learning preferences, making them particularly valuable in online and hybrid environments. The study concludes that pedagogically well-designed and interactive video content can significantly enhance student engagement, autonomy, and knowledge retention. Future research should explore long-term learning impacts and the potential of adaptive technologies and artificial intelligence to further personalize video-based learning experiences.

Keywords: educational videos, pedagogical effectiveness, learner preferences

1. Introduction

The digital transformation of education is one of the most significant changes of the 21st century, fundamentally reshaping teaching and learning methods. With the rise of online learning formats, educational videos have become a defining tool for knowledge transfer, as they allow learners to acquire knowledge at their own pace, independently of time and place, in a manner that suits their preferences. Educational videos are also playing an increasingly important role in higher education, a fact that was further confirmed by the pandemic of 2020: in both online and hybrid education, video content has become indispensable. Universities around the world are widely using recorded lectures, explanatory, or demonstration videos to support education, and MOOCs (Massive Open Online Courses) have also become popular, offering unlimited number of participants, video lectures, online tests, interactive forums, and other digital learning resources (Kaplan & Haenlein, 2016).

Research on the effectiveness of educational videos confirms that the combination of visual and verbal information helps to guide students' attention, thereby contributing to reducing cognitive load (Noetel et al., 2021). Furthermore, educational videos play a significant role in supporting autonomous learning, enabling students to master content according to their own pace and schedule (Ploetzner, 2022).

This study aims to examine the types, genre characteristics, and effectiveness of educational videos in the context of higher education, with particular attention to the expectations of students and the results observed in practice. The foundation of the paper is primarily based on related domestic and international literature sources.

2. Genre Characteristics and Types of Educational Videos

The effective use of educational videos requires a clear definition of the genre characteristics and types that enable these tools to optimally fit into the teaching and learning process. In exploring the genre features, it is essential to examine the communication and didactic functions of the videos, as these determine how effectively the content can capture and maintain students' attention, as well as how well it supports deeper understanding (Chen & Wu, 2015; Arruabarrena et al., 2021). The detailed analysis of the categories presented below also addresses the methodological applicability of the videos, helping instructors use the content in a pedagogically thoughtful and goal-oriented manner.

2.1 Lecture-Type Videos

Lecture-type videos (lecture capture) are digital versions of traditional classroom teaching, in which instructors record their lectures in audiovisual form. These videos typically include presentations accompanied by slides and oral explanations. The goal of lecture-type videos is to present theoretical knowledge in a structured way, which is particularly important for understanding conceptual foundations.

The quality of lecture recordings plays a key role in student satisfaction: well-produced recordings with clear sound and proper lighting improve the learning experience and make it easier for students to focus on the content (Sanders, 2022; Edwards & Clinton, 2019). Henderson and Schroeder (2021) also emphasize that the instructor's personality and style can significantly contribute to the effectiveness of such videos: charismatic instructors who explain clearly are better able to capture students' attention, thus increasing their engagement with the content. However, lecture-only videos are prone to monotony if they lack visual elements or interactive opportunities that help maintain attention (Nordmann et al., 2020).

An example of a longer lecture-type educational video is the "Távoktatás magyar nyelven” (Distance Learning in Hungarian) page available on YouTube, while a shorter version includes the content uploaded by teacher Attila Horváth on TikTok, covering topics in Literature and History. In the latter case, several "TikTok-teacher" profiles can be highlighted (@mate_bacsi, @matekoscsiszi, @idoutazo.yt, @hannamatek), they are educators who regularly share short video content on this social media platform.

2.2 Animated Videos

Animated educational videos use dynamic visual elements, such as graphs, infographics, and moving illustrations, to make abstract concepts and complex processes easier to understand. Mayer (2021) found that animations play a key role in reducing cognitive load, as they help students process visual and verbal information simultaneously.

Animated videos are especially effective in teaching natural sciences, engineering, and economics, where visualizing concepts and processes is often essential for understanding. Among their advantages is the ability to maintain attention and present information in a structured way, making it easier for students to understand and remember the content (Kleftodimos, 2024).

A Hungarian example of an animated educational video is the Zanza TV website, which offers a free online portal for high school students, featuring approximately five-minute animated explanatory videos and related interactive tasks, organized by school subject, to support quick and enjoyable mastery of the material.

2.3 Hybrid-Type Videos

Hybrid educational videos aim to integrate both visual and auditory learning channels by combining animations and instructor narration. This type allows for the simultaneous presentation of theoretical knowledge in both visual and verbal forms, which is particularly useful for processing complex content. According to Fyfield et al. (2019), the effectiveness of hybrid videos stems from the fact that students receive information through multiple channels simultaneously, which aids deeper processing and long-term retention. These videos are also suitable for combining theoretical and practical elements, making them an excellent tool for demonstrating practical applications. A Hungarian example of this is the YouTube channel "Holnap témazáró," (We Have a Test Tomorrow) which offers free videos summarizing mandatory high school reading materials in videos no longer than ten minutes, allowing students to quickly and clearly review the works even just before a test.

2.4 Demonstration Videos

A demonstration educational video is an audiovisual teaching format that presents a practical procedure, experiment, or sequence of actions step-by-step in a real or simulated environment, allowing students to learn the desired skills through observation before actually practicing them. This format enables students to visually follow each step while the instructor’s verbal explanation helps in understanding the processes. Such videos can be particularly effective if they include slow-motion footage, detailed instructions, or supplementary infographics (Ding et al., 2024; Vigeant & Golightly, 2022).

The YouTube channel "Szertár" (Storeroom) presents exciting and comprehensible physical and chemical experiments, thereby playfully encouraging young people to engage in scientific thinking and expand their knowledge at home. The "Észbontogató" (Mindblowing) and "Alkímia ma" (Alchemy Today) series from the ELTE Faculty of Science combine classical laboratory demonstrations with high-resolution, multi-camera video technology, allowing students to closely observe the critical phases of reactions with explanatory commentary and visual annotations, thus gaining a deeper theoretical and safety understanding before engaging in actual laboratory work.

2.5 Interactive Videos

Interactive educational videos aim to encourage active participation from students, for example, through quizzes, tests, or problem-solving tasks. Interactivity allows students to receive immediate feedback on their knowledge, fostering a deeper connection with the educational content.

Ploetzner's (2022) meta-analysis found that videos with interactive elements significantly improve learning outcomes because they help sustain students' focused attention and cognitive engagement. These videos can be especially useful in self-directed learning processes, as they allow for self-assessment and immediate correction.

A Hungarian best practice is the YouTube-based H5P interactive video presented at the 2023 Networkshop conference by the University of Debrecen’s Multimedia and E-Learning Technical Center. This demonstrated how an educational video can assess what students have learned through pop-up multiple-choice questions, linked background explanations, and a concluding "Submit screen." This allows students not only to be passive viewers but also to receive immediate feedback on their answers, which can be logged as scores in Moodle (Köpösdi, 2023).

2.6 Live Broadcasts

Live-streamed educational videos — that is, synchronous, online-streamed lectures — represent a form of digital education where the instructor and students connect in real-time through an interactive video platform.

The live format allows for immediate interaction between the instructor and students, especially if students can ask questions or receive real-time feedback.

Casillas-Hijuelos et al. (2022) noted that live broadcasts increase student engagement and motivation, as the instructor's physical presence and the opportunity for interaction provide a unique learning experience. However, Hung et al. (2024) also point out that without proper didactic planning, live-streamed videos can cause attention loss, just like lengthy, pre-recorded content. Technically, it is important to ensure smooth functioning of the network and platform, as any issues may increase student frustration, leading to a decrease in motivation and a reduction in involvement during the class.

In addition to a stable infrastructure, the instructor's digital competence is also crucial, as real-time moderation and management of a hybrid audience are required (Koh & Daniel, 2022).

The Videotorium Live Broadcast section operates as a common streaming platform for Hungarian universities, where students can follow lectures in real-time (Videotorium, 2025). Similarly, Coursera's national partners also offer the option of live-streaming accredited course lectures via Zoom, which can later be re-watched in the course's video library (Live2Coursera, 2024).

3. Effectiveness of Educational Videos

The diversity and adaptability of educational videos clearly reflect their pedagogical value. However, these different genres can only produce lasting learning outcomes if both didactic and technological considerations are taken into account simultaneously. Examining the effectiveness of educational videos is a complex process that depends on many factors, including pedagogical design, technological solutions, content structure, and the degree of student interaction. Below, we will present the factors related to the correlations and practical findings found in the literature.

3.1 Multimedia Design

Multimedia learning principles, developed by Mayer (2021) and other researchers, highlight that combining visual and verbal information significantly improves learning outcomes because students process information more effectively when it is presented in both visual (e.g., graphs, animations) and auditory (verbal explanations) forms, especially for complex topics like the natural sciences or technological applications.

Moreover, minimizing cognitive load is particularly important when designing educational videos. This means that the videos must have clearly structured content, directly aligned with specific learning goals. Avoiding overly complicated or irrelevant elements helps improve students' concentration while aiding in the retention of information (Fyfield et al., 2019).

Another advantage of multimedia design is its adaptability to students' varying learning styles. For students who are visual learners, infographics and animations can be helpful for easier processing, while auditory learners may find detailed narrations particularly useful (Jacob & Centofanti, 2024).

3.2 Optimal Video Length

The length of educational videos directly influences students' ability to maintain attention and process the information. According to Brame (2016), the ideal video length is between 10-15 minutes, as this time frame allows students to maintain concentration. Longer videos — especially those exceeding 20 minutes — may decrease attention, as students tend to lose interest, particularly true for today's younger generation, who tend to have short attention spans (Philip & Bennett, 2021). Nordmann et al. (2020) also confirmed in their study that for longer videos, it is advisable to divide them into shorter logical segments (ideally 6-10 minutes) because student engagement sharply drops after 9 minutes.

Noetel et al. (2021) found in their meta-analysis that shorter, focused videos are more effective as they reduce cognitive overload while offering students the opportunity to process the material in short sections. This is especially true for content that contains large amounts of information and requires further independent study.

3.3 The Role of Interactivity

Interactive elements are among the most important features of educational videos, as they significantly increase student engagement and active participation. Ploetzner (2022) found that interactive elements embedded in videos, such as quizzes, feedback opportunities, or decision points, have a positive impact on learning outcomes, as they not only maintain students' attention but also support the development of their independent learning skills.

Interactivity also enhances student motivation, as it provides an opportunity for students to immediately apply and test the knowledge they have acquired, strengthening the understanding of the connection between theory and practice and highlighting the importance of feedback (Geertshuis et al., 2021). Integrating self-assessment opportunities can be particularly effective in facilitating deeper understanding.

3.4 The Importance of Visualization

The use of visual elements plays a key role in maintaining students' attention and explaining complex concepts in educational videos. Experimental studies show that dynamic diagrams, highlights, and annotations used in videos significantly improve information recall and the effectiveness of applying knowledge in new situations, compared to purely text-based or static versions (Fiorella & Mayer, 2018).
Noetel et al. (2021) also found that visual elements increase student satisfaction because they make abstract concepts more concrete, thereby making it easier to understand complex materials.

3.5 The Importance of Instructor Presence

The instructor’s personality and presentation style greatly affect students' motivation and attention. In educational videos, "instructor presence" does not merely refer to the camera view, but to the unity of cognitive, social, and learning organization dimensions. According to an empirical study based on a theoretical framework developed for online and hybrid learning settings (Community of Inquiry model), courses are more successful when the instructor uses their own face, makes eye contact through the camera, and poses explicit focus questions, as this creates a stronger social presence and leads to deeper conceptual processing (Garrison & Cleveland-Innes, 2020; Borup et al., 2020).

Henderson and Schroeder (2021) found that the instructor’s presence, gestures, and speech style increase student engagement by providing a more personal learning experience. Vivid gestures and dynamic intonation positively affect students' attention, while a monotonous presentation style tends to reduce interest.

The instructor's personality plays a key role not only in transmitting information but also in building student relationships. The sense of instructor presence can be enhanced by interactive opportunities, such as real-time questions and answers.

3.6 Content Balance

Effective educational videos achieve their goals by integrating theoretical and practical elements in the right proportions. Ding et al. (2024) found that students who watched videos enriched with practical examples and short case studies showed 26% higher interest scores and significantly better test results compared to the control group that viewed a purely frontal, theoretical version. This result aligns with Merrill’s “First Principles” model, which states that learning material is most effective when theoretical content is supplemented with immediate application tasks (Merrill, 2002). These approaches not only increase the relevance of the material but also offer students opportunities to apply knowledge practically, which is especially important in fields such as the natural sciences, technology, and engineering, where hands-on experience is crucial for reinforcing conceptual understanding.

4.Conclusions

Educational videos have become one of the most important tools in the advancement of digitalization in higher education. Due to their flexible format and easy accessibility, they are well-suited to meet the diverse needs of students, particularly in online and hybrid educational environments. These tools are not only effective means of transmitting knowledge, but they also play a key role in developing students' autonomous learning abilities, as they allow learners to process materials independently, according to their own schedules, with the option to review difficult sections. Educational videos enhance student motivation, especially when their content is rich in visual elements and complemented with interactive components. Due to the heterogeneous nature of students, educational videos can also be adapted to individual learning styles, thereby ensuring broader inclusivity in education. To increase the effectiveness of educational videos, it is crucial to have didactically well-thought-out, well-structured content and the incorporation of interactive elements. A logical structure of the material reduces cognitive load, while interactivity increases students' attention and active participation. Technological innovations, such as adaptive learning materials and learning analytics, offer further opportunities to personalize the learning experience. Integrating student feedback is also essential, as feedback helps not only to improve the content's pedagogical and technical quality but also creates opportunities to better map and meet user needs.

The long-term effects of educational videos remain an unexplored area in scientific research. It is especially important to understand how these learning tools influence knowledge retention, the ability to apply knowledge, and the development of students' learning strategies. Further research is needed to determine which video types are the most effective for different target groups, such as varying age groups, academic disciplines, or learning preferences. The role of interactive technologies and artificial intelligence could also be a promising direction for future developments in this field.

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