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Factors Influencing Video Consumption in Online Learning

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Abstract: Online learning via videos is increasingly emerging as a popular educational medium due to its flexibility in time and accessibility. This review analyzed the main elements that influence the effectiveness of educational videos, with a specific focus on evaluating the relationship between video characteristics and their attractiveness. Specifically, it discussed the effect of the presenter's appearance, personality, and non-verbal behaviors on student engagement and learning outcomes. In addition, it reviewed the influence of various video traits, such as segmentation and communication, on viewer's engagement and satisfaction. This paper also evaluated the benefits of interactive videos compared to linear versions. The results emphasize the crucial function of the presenter and the quality of visuals in improving video consumption and learning outcomes. Moreover, interactive aspects can contribute to a moderate improvement in learner satisfaction. However, the previous study is constrained by limited participants and targeted online learning platforms. Future studies should investigate the effectiveness of online learning in participants with a wide range of socioeconomic backgrounds using personalized video designs.

Keywords: educational psychology, online learning, video consumption.

1. Introduction

Online learning is an extension of distance education, also known as digital learning, that relies on digital technology for instruction [1]. Online video consumption refers to the activity of users watching video content that they have paid for on different digital devices through the Internet [2]. Studies on online learning are needed as they have the potential to benefit society significantly from both an educational and economic standpoint. Firstly, e-learning videos are not limited by location because they are distributed through the internet, allowing students in rural or under-resourced locations to study. Furthermore, e-learning is very flexible in time, enabling students to learn on their place. The online learning videos decrease the cost by minimizing students' transportation and lodging expenses. In addition, spending money on educational videos may greatly decrease the costs for renting the classrooms and purchasing equipment that educational institutions need for offline learning. During pandemics, online learning videos have emerged as a crucial instrument in the educational systems worldwide, to address disasters. It not only inhibits the transmission of contagious diseases but also supports the sustainability of the education industry.

In previous research, Mayer's study reviewed the evolution of learning theories over the past three decades and explored how individuals use digital media for learning [1]. The cognitive theory of

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multimedia learning highlights the need to meet the requirements for dual-channel (auditory and visual) stimulation to achieve high-quality online learning. This theory offered guidance for creating multimedia instructional materials that effectively use verbal and visual information to promote meaningful learning. Furthermore, the researchers identified several crucial factors that impact the quality of online learning. These factors include removing unnecessary content to ensure coherence, emphasizing important information based on the signaling principle, avoiding redundant text on the screen, and synchronizing audio and visuals [1].

In another previous study, Wallace evaluated and synthesized studies on the dynamics of online learning in higher education, focusing on instructor-student interactions. The researcher evaluated the psychological and communication disparity between instructors and students in online learning and examined the impact of this disparity on student engagement and comprehension. Subsequently, an evaluation took place on the many pedagogical approaches and techniques educators employed in the digital setting, encompassing feedback mechanisms, modes of communication, and the utilization of multimedia resources. In addition, an analysis of the procedures and elements that contribute to forming group teams in online learning occurred. Finally, the researchers discussed the advantages and disadvantages of collaborative learning in online settings, including improved critical thinking, knowledge production, and social skill development. The objectives of this review were to understand better and improve the interactions of online learning videos, to develop collaborative learning communities, and to use emerging technology to improve the online learning experience [3].

Video consumption in online learning possesses unique characteristics and notable benefits that set it apart from other online forms, such as Zoom conferencing or reading online materials. Video consumption is inherently more captivating and exciting than consuming reading materials. Engaging with online materials typically demands extensive self-control and focus, while individuals commonly experience weariness and disinterest after extended reading periods. Yet, instructional videos can more efficiently captivate students' focus by combining auditory and visual stimuli. Plus, video consumption has greater flexibility in time and convenience compared to Zoom meetings. The latter necessitates participants to be simultaneously present online at a predetermined time, which can prove troublesome for those with varying schedules and residing in different time zones. On the contrary, videos can provide the convenience of being accessible at any time and place, eliminating the need for rescheduling concerns. Plus, students can halt, rewind, and review videos at their preferred speed of comprehension until they have a complete understanding of the content. As a result, following the pandemics outbreak, despite using large amounts of online videos for instruction in various courses, there has been a lack of thorough attention and analysis of methods to enhance consumer motivation and outcomes through improved video instruction.

2. The Relationship between Video Features and Attractiveness

The main factors impacting video consumption can be broadly classified into three domains: the presenters, the visual attributes of the video, and additional video characteristics. To validate the influence of these three elements, Zhou and colleagues built a framework that utilizes machine learning and computer vision techniques [4]. This framework was tested using two distinct datasets: one provided by MasterClass, which includes 771 videos, and another from Crash Course, containing 1,127 videos. The study employed multifaceted methods to accomplish the objectives. The high-resolution videos were transformed into low-resolution during data preprocessing to manage the data size. Additionally, the time-coded subtitles were extracted to aid in the analysis process. The extraction of content-related information was categorized into three groups: emotional and physical traits of the presenters, video visual qualities (including color saturation, brightness, and contrast), and other video features (such as video duration, scene transitions, rate of speech, and segmentation). Overall, the measured variables in the experiment were video completion (Y_complete) and watching

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the following video (Y_next). Also, the other variables included basic video attributes (e.g., video length), instructor mood, physical characteristics, and visual aesthetics. Therefore, the control variables during the experiment included the average completion rate of consumers and the course ID dummy variable. The results clearly illustrate the significance of video visual quality, video instructors, and other features in predicting customer viewing behavior. These characteristics are critical in determining whether viewers finish a video and continue to watch the following one.

2.1. The Role of Presenter

The shortage of using behavior outcome is that researchers cannot make sure whether the consumer paid attention to the video or not throughout watching. This study used eye-tracking equipment to explore the specific elements that participants prioritize while engaging in video-based learning [5]. Hence, researchers gathered data on the learners' visual attention during the viewing of instructional videos. The purpose was to offer insights on enhancing video design and predicting quiz scores based on visual attention patterns. A total of 224 participants engaged in the study, and they watched four brief instructional video segments. The study evaluated diverse methodologies to forecast learning outcomes using eye movement data. Participants were asked to take a questionnaire following a brief educational video to assess their understanding. The webcam was used to collect eye gaze data in real time, which was then analyzed using the Python libraries OpenCV. The researchers classified data into text, image, teacher, and other sections and deleted any anomalies. In brief, the variable in this experiment is the composition of the e-learning video clips that the learners concentrate on, specifically the textual content, visuals, and instructors depicted in the video frames. The learners' comprehension of the video was measured by giving the tests. The study stated that learners achieved greater scores on quizzes when they spent more time gazing at the teacher rather than focusing on the text and graphics displayed on the screen. They found a positive link between instructor attributes and quiz scores. Furthermore, the teacher's emotional expression (performance) may influence the quality of instructional videos.

Considering personality of the presenter is crucial to create videos with higher attractiveness. The purpose of this study was to investigate how the personality traits of instructors—Extraversion, Non-Neuroticism, Likability, Conscientiousness, and Openness—affect the success of online educational videos while carefully controlling variables such as video duration, speech tempo, emotional impact, visual appeal, and instructor characteristics [6]. The main objective is to identify the specific personality qualities that positively impact engagement and retention, as indicated by the number of video views and likes. The research focused on a specific group of videos, including 10,000 tagged videos from the First Impression dataset used to train the model and 13,869 instructive videos from YouTube. The researchers combined advanced machine learning and deep learning techniques to predict the impact of lecturer personality on video performance. The method commenced by gathering and pre-processing data, extracting video duration, speech tempo, lecturer's emotional state, and visual appeal. To ensure accurate results, the researchers carefully controlled variables such as video duration, rate of speech, duration of scenes, emotional impact, visual appearance, and instructor features to prevent any factors that can confuse. Subsequently, they examined how the teachers' personality attributes influenced the number of views and likes received by the videos.

The outcomes of the research showed that teachers' personalities substantially influence the success of online educational videos. Extroversion positively impacted video efficacy, whereas openness had a detrimental effect. Furthermore, visual signals had the most significant influence on predicting personality traits, with auditory and literary cues following closely after. Plus, personality traits vary by observable features such as age and gender. The findings support that online education systems have the potential to enhance instructor and class style selection by considering personality factors, resulting in higher levels of engagement and retention.

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Besides personality and content, the non-verbal cues of instructors may also trigger different responses. Consequently, even when different instructors teach the same information, the quality of education may have varying results. This might be described as teachers' non-verbal immediacy (NVI) [7]. NVI encompasses maintaining eye contact, displaying facial expressions, and using gestures. The experiment consisted of 87 participants, primarily college students, with an average age of 24.11 years. The study featured a controlled experimental design where individuals were randomly allocated to three conditions with varying levels of NVI: low, medium, and high. For each scenario, an experienced performer assumed the role of the instructor to showcase various levels of non-verbal behavior. The experimental sessions consisted of pre-test and post-test questionnaires to evaluate cognitive learning, state motivation, and state enjoyment. In addition, the study used eye-tracking equipment to quantify the subjects' visual attention by tracking the frequency and duration of their glance toward both the teacher and the learning materials. After considering variables such as age, gender, language abilities, general cognitive ability, and prior knowledge of cryptography, this research explored the effect of teachers' NVI on video lectures' cognitive, motivational, and affective outcomes. Findings showed that elevated levels of NVI substantially affected learners' motivation and enjoyment. However, there was no observed effect on cognitive learning results. The eye-tracking data found that participants in the high NVI condition directed more attention toward the teacher than the learning material. Non-verbal behaviors primarily impact the emotional and motivational components of learning instead of the cognitive aspects.

2.2. The Impacts of Other Video Features

As mentioned above, segmentation and signaling are crucial aspects of educational videos [4]. Thus, this study was to find out how segmentation and signaling influence social media engagement [8]. The participants were general YouTube viewers who watched educational content on relevant topics. Researchers sampled 196 videos on 28 physics and astronomy topics based on YouTube's educational focus and popularity. In the experiment, the researcher used self-rated scale to rank the sample videos according to their popularity on YouTube. Additionally, the researcher chose seven exemplary video samples to analyze each topic. This covered the assessment of several factors such as views, likes and dislikes, comments, and shares. The presence of video chapters measured segmentation, while the textual and visual signals in the video measured signaling. All in all, control variables included days to video release, video length, resolution, and loudness, and finally, hierarchical multiple linear regression models were used to test hypotheses. The data analysis revealed significant correlations between segmentation, signaling and social media engagement. Segmenting had a strong negative correlation with involvement, intimacy, and interaction. In contrast, visual signaling positively correlated with all four dimensions of engagement, and textual signaling also had a positive impact on engagement. These findings highlight the greater effectiveness of visual signals compared to textual signals in enhancing viewer engagement.

In addition to examining the effects of segmentation and signaling on social media engagement, what features of the videos are most appreciated by the audience through analyzing the comments on educational content were also essential to examine. The researchers gathered 167,987 comments from 59 educational videos on the TedEd YouTube channel [9]. These videos encompassed various subjects like mental health, creative writing, architecture, and insects. This study used the YouTube Data API and Google Sheets to collect the data, followed by routine data cleaning. Two lexicon-based sentiment analysis tools were employed to evaluate the sentiment of the comments. In addition, the researchers utilized the Latent Dirichlet Allocation (LDA) approach to perform topic modeling. This experimental procedure was employed to ascertain the impact of the content features of YouTube educational videos on the emotions of viewers. As a result, video features such as animation and music are frequently linked to positive emotions, indicating that these elements significantly improve

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the educational experience. Educational institutions can use these findings to enhance their teaching methodologies.

Other features that extend beyond previously mentioned, such as the presence of comments on educational videos is also seen as a potential factor affecting learning outcomes. Firstly, researchers found that commenting on videos (social presence) is related to learning satisfaction [10]. Secondly, it intended to check out the impact of social presence on the learning outcomes of students with different personalities (specifically conscientiousness and extraversion) and its influence on user outcomes such as perceived learning effectiveness and satisfaction. Study 1 comprised a sample of 71 participants, while study 2 consisted of 150 persons. With the goal of determining which factors would induce learning effects and user satisfaction, the researchers developed two variables: user comments (to improve social presence) and consumer personality characteristics. study 1 involved 71 individuals who were exposed to a 7-minute instructional video on cooking. The researchers divided participants into two groups: the experimental group, which showed user comments, and the control group, which did not. In study 2, social presence was assessed using a six-item scale. 150 participants were initially instructed to fill out a survey assessing their personality traits. Subsequently, they viewed a 4.5-minute educational video on the scientific aspects of sleep. Finally, they provided ratings on their perceived learning efficacy and overall satisfaction. Findings of the first study established notable differences between the control and experimental groups on social presence, so supporting the hypothesis that user comments augment social presence. The second study found that commenting can improve learning outcomes for students with different personality factors. For instance, individuals with poor conscientiousness reported more benefits from social presence, which resulted in enhanced views on video learning and enjoyment.

3. The Effectiveness of Interactive Videos

As previously mentioned, the convenience of video lessons enables students to view them at any time. Nevertheless, this unavoidably compromises the amount of interactivity that is essential in the process of education. In order to overcome this limitation, some interactive videos were created. The objective of this study is to evaluate the influence of interactive frameworks on students' learning experience by comparing interactive videos and regular linear videos [11]. The participants were students enrolled in Turkey, ranging in age from 20 to 24 years old. Initially, the course included 22 students, but the final sample size was reduced to 18. The study intended to test the disparities between linear and interactive videos regarding student pleasure, engagement, and achievement.

The study employed a quasi-experimental approach with two experiments. During the initial trial, participants viewed three linear videos spanning a duration of three weeks. Subsequently, they were assessed using quizzes and asked to complete satisfaction and engagement scales. Throughout the procedure, the clickstream behaviors of the video were examined to discern significant interactions, including pausing, advancing, and rewinding. Then, the researcher interviewed the students involved in the study and professionals in the field to create an initial framework for intervention. In the second experiment, six distinct videos (three linear and three interactive) were observed throughout six weeks, with a pre-test and post-test for each video. The interactive videos incorporated many components, such as inquiries, textual content, visuals, and hyperlinks, all aligned with the original framework. In final, the framework's effect on satisfaction, engagement, and accomplishment was evaluated through the utilization of tools such as the Learner Satisfaction Scale, the Video Engagement Scale, and the Scale of Situational Motivation. Hence, this experiment was designed to find the correlation between the execution of the intervention framework and satisfaction, engagement, and academic achievement. After controlling for motivation, there was a noteworthy impact on satisfaction, showing that interactive video marginally enhanced satisfaction in comparison to linear video. Moreover, the

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findings indicated that the effects of linear and interactive videos were similar regarding student happiness, engagement, and achievement.

4. Conclusion

Studies indicate that the presenter, the visual quality, and the video features substantially impact the quality of teaching and the consumption of videos. The role of the teacher in videos greatly increases pupil participation and improves learning outcomes. Also, the effectiveness of these videos depends on the personalities of both the teacher and the student. In addition, it has been suggested that teachers who exhibit a high level of NVI behaviors can raise student motivation and pleasure. Among other video features, proper segmentation and visual cues are crucial, with visual cues being more impactful than written ones. Moreover, audiovisual features like animations and music may provoke good feelings from viewers, boosting their entire educational experience. Lastly, research showed that interactive videos have a modestly higher level of learner satisfaction than linear videos.

While these studies yield important insights, there are still certain limits. Primarily, the samples from most of the studies are based on a single video platform, which may not sufficiently capture the influence of alternative platforms. Furthermore, several research included small experimental sample sizes and lack of the gender or racial disparities among the viewers, thereby restricting the generalizability of the findings. Plus, a potential limitation of some studies is the lack of longitudinal testing, as the immediate memory may confound the single post-course test, thus weakening the accuracy of the results. After these limitations are solved, future research might investigate differences in the efficacy of educational videos across socio-economic contexts and examine strategies for designing and distributing these videos to ensure equitable access to learning opportunities for individuals from diverse backgrounds. Additionally, researchers have the opportunity to investigate how learning videos would be customized based on students' personalities, learning styles, and ability levels.

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