

Creating Effective Educational Videos on YouTube in Higher Education [†]

John C.-C. Lu

Department of Civil Engineering, Chung Hua University, Hsinchu 30012, Taiwan; cclu@chu.edu.tw

[†] Presented at the 3rd IEEE International Conference on Electronic Communications, Internet of Things and Big Data Conference 2023, Taichung, Taiwan, 14–16 April 2023.

Abstract: Educational videos have become an important part of higher education. Thus, it is necessary to discuss practical tips for creating high-yield educational videos. The electronic medium is integrated into traditional courses and serves as the cornerstone of many blended courses. Multiple studies have demonstrated that video is a highly effective educational tool for learning, particularly for hard-to-visualize processes and procedural education. Video allows learners to view content at their own pace and view on-demand materials repetitively. Video on YouTube can be integrated as a supplement to course content to provide targeted information and enrich the learning environment for students. In this article, creating an effective video on YouTube is introduced, providing examples of effective recording and integrating video into engineering mathematics courses on YouTube.

Keywords: educational video; YouTube channel; higher education; engineering mathematics

1. Introduction

YouTube videos are commonly used in higher education. D'Aquila et al. [1] concluded that students viewed the videos primarily for exam review, and video usage improves student performance. Jackman [2] used YouTube in three psychology classes at the University of Trinidad and Tobago and found that YouTube can be used in tertiary education pedagogy. Hoa et al. [3] proposed building a healthy and positive YouTube Kids channel suitable for the characteristics of primary school students. Nabayra [4] investigated students' experiences with the use of teacher-created videos in learning mathematics online and revealed that teacher-created videos were helpful for students to self-assess their learning progress. Makruf et al. [5] concluded that Moodle was less optimal in the implementation and evaluation of learning in higher education. Hendriyani et al. [6] developed online learning videos to improve students' creative thinking skills. Bauk [7] discussed the benefits and challenges of international virtual exchange in teaching and learning at higher education institutions. Noetel et al. [8] systematically reviewed the effects of video on learning in higher education and concluded that videos were unlikely to be detrimental and usually improved student learning. Fyfield et al. [9] suggested that videos be accompanied by learning activities rather than watched passively. Miner and Stefaniak [10] compared instructors' and students' perceptions regarding the use of video during instruction. Kohler and Dietrich [11] showed that both social status and individual predispositions influenced the outcome of educational videos. Shoufan [12] tried to use viewers' ratings and participation to measure the quality of educational videos. The findings of Çelik et al. [13] showed that the most used social media tools were also used for educational purposes, and the most significant exception in this subject was TikTok. Boey et al. [14] investigated how the integration of technology contributed to the development of attributes or learner profiles suitable for the workplace and real-world performance while also meeting skill-based learning outcomes.

YouTube can be a powerful tool for education beyond the classroom. Educational videos can be easily uploaded to YouTube, and using these virtual teaching materials



Citation: Lu, J.C.-C. Creating Effective Educational Videos on YouTube in Higher Education. *Eng. Proc.* **2023**, *38*, 32. <https://doi.org/10.3390/engproc2023038032>

Academic Editors: Teen-Hang Meen, Hsin-Hung Lin and Cheng-Fu Yang

Published: 20 June 2023



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has been highly favored by educational organizations. Many studies have shown the application and effectiveness of creating educational videos on YouTube. Therefore, the author has recorded more than 1800 teaching videos on engineering mathematics. Most recorded videos of teaching last less than 15 min and have been uploaded to YouTube for students to view for free. Without advertisements, students can concentrate on self-study. The synchronous class recording is avoided to improve the quality of recording teaching videos. The script writing, directing, and editing of self-recording videos are completed by the author, which saves time for editing. Sometimes, re-recording 3–5 times improves the quality of the teaching video, though most videos are recorded in one take. Each video deals with one theme to construct students' confidence through the thematic teaching materials.

In this article, the experience of recording high-quality teaching videos is shared. A questionnaire analysis was conducted on the effectiveness of teaching videos for 26 students in the engineering mathematics courses. The statistical analysis result showed that planning for learning was evaluated as favorably with a score of 4.81 on a 5-point scale. This shows the effectiveness of teaching videos on YouTube.

2. Effective Educational Videos

The video needs to be recorded using the fundamentals and principles of photography. Furthermore, it is also necessary to understand the golden ratio of the contents and the principles of art. The following are suggestions based on our experience with more than 1800 self-recorded teaching videos.

- **Why do I need to record teaching videos?** Making the classroom joyful and interesting is an important consideration. Attractive teaching videos are required for students to preview and review lessons at their convenience through teaching videos on YouTube. The instructional videos on YouTube are set to public mode, and the interference of advertisements is not allowed;
- **How do I make lesson videos for students?** It is required to be accustomed to recording instructional videos by camera and computer screen capture. Camera skills and computer screen capture software are demanded. The learning process may take several weeks;
- **What should I do if funds are insufficient?** Many teaching units on the campus can provide cameras or teaching software. Teaching equipment can be rented from the academic affairs office. Higher-priced equipment may not be required. Instructional videos can be recorded with a cheap microphone;
- **What should I do if there is no studio room?** The classroom is a suitable studio with a digital camera. A high-resolution digital camera is needed for recording. Synchronous recording with classes must be avoided to improve teaching video quality. In addition, when using an empty classroom, it is necessary to overcome the psychological barrier of no audience;
- **How to improve my digital literacy?** It is necessary to be motivated to learn new digital skills. Even though digital hardware and software are constantly evolving, video production skills have not changed much. There are good ideas for integrating new technologies into teaching by searching for 3C products;
- **Is the artistic effect of teaching video insufficient?** Students want to learn logical thinking and problem-solving from teaching videos rather than appreciate video styles. In addition, if the teacher writes mathematical symbols neatly, it helps students' learning;
- **What should I learn about digital software?** There are many kinds of digital software for making educational videos, such as Power Director, Camtasia, and MS Teams, which are the most commonly used. There are similar applications, and the choice depends on whether it is easy to obtain the licensed software;
- **No time to record instructional videos?** Teachers are usually busy. Therefore, only interest and enthusiasm can provide sufficient motivation. At the right time, in the right place, and with the right people, the teacher needs to complete the recording of

teaching videos. If teachers have enough time to record teaching videos, the quality and quantity of the videos can be gradually improved;

- **It is necessary to have an understanding of copyright law.** Teachers need to understand the copyright law. Although the copyright law has restrictions, it also allows protection. Therefore, teachers need to understand the law before recording teaching videos and collect the materials for recording the teaching video. If necessary, Creative Commons-licensed materials can also be used;
- **Personal capability.** Every teacher has different specialties and abilities. Teachers do not have to record teaching videos to achieve academic success with their abilities. The academic achievements required are multifaceted, and academic efforts in all aspects need to be appreciated;
- **Pre-arrangement of course planning is required.** Usually, teachers can be prepared for their teaching courses in the next few years. Planning the courses is conducive to recording teaching videos. It is convenient for teachers to record the whole educational video of a subject;
- **Awareness of teaching is one of our academic achievements.** Most teachers agree that teaching is an academic achievement equivalent to research accomplishment. Therefore, achievements are critical for teachers in college. Paying attention to the learning effects of students is important for college teachers;
- **Actively participate in teaching workshops or communities.** Through academic information exchanges in communities or workshops, teachers can obtain assistance and the latest information on educational training. It also creates opportunities for academic cooperation with teachers on campus. In the teaching community, information can be obtained, such as the application of the metaverse in education;
- **Sharing the recorded teaching materials.** Sharing and helping each other increase the influence of educational videos. Self-made teaching videos can be provided on free platforms such as YouTube. Virtual interaction with talented students throughout the world is possible;
- **Publishing teaching results on YouTube.** Uploading videos on YouTube is a type of publication, and the influence of YouTube is greater than that of journals or conference papers. The public release provides feedback on teaching achievements through discussions with viewers;
- **The publishing platform for reviews.** Submission of journal or conference papers requires rigorous peer review. Equivalently, teaching videos on YouTube need to pass a strict YouTube review process. Furthermore, students can become reviewers who provide valuable feedback;
- **Digitization preserves teaching records.** Many teachers have accumulated a large amount of teaching output. If the teaching materials can be organized and recorded into digital files, they are more conducive to inheritance, promotion, and preservation. One of the advantages of digitization is that it improves the efficiency of teaching;
- **When the going gets tough, the tough get going.** The production of teaching videos requires time and energy. It is difficult to achieve successful results without extraordinary perseverance. It is criticized sometimes for keeping free instructional videos on YouTube;
- **The traditional teaching mode still needs to be preserved.** Although the teaching mode can be changed through the recording of teaching videos, the traditional face-to-face teaching mode is still needed as communication between teachers and students is important;
- **Try to do all the work independently.** Teaching is a long-term career. It is difficult to maintain a studio team to record teaching videos for a long time. Therefore, teachers need to train themselves to become screenwriters, directors, and video editors. Then, recording teaching videos may last longer;

- **Writing course handouts.** In addition to recording teaching videos, teachers need to provide lecture notes for students' reference. Lecture notes are uploaded next to the corresponding teaching video so that students can easily click on them for reference;
- **Enjoy yourself.** Recording instructional videos is a difficult task. If the teachers enjoy recording teaching videos, they can continue for a long time.

3. Questionnaire Survey

An online questionnaire survey was conducted to collect data to understand how satisfied students were. The questionnaire was distributed to students in the engineering mathematics course. The questionnaire was created on a Likert 5-point scale, as shown in Tables 1 and 2. Questionnaires with full responses were included in the analysis.

Table 1. The score for each option.

Option	Score
Strongly Disagree	1
Disagree	2
Neither Agree nor Disagree	3
Agree	4
Strongly Agree	5

Table 2. Interpreted students' responses based on scores.

Interval	Students Responses
$1.00 \leq x < 1.80$ ^a	Very Bad
$1.80 \leq x < 2.60$	Bad
$2.60 \leq x < 3.40$	Neutral
$3.40 \leq x < 4.20$	Good
$4.20 \leq x \leq 5.00$	Very Good

^a x = Scores of each indicator.

Based on the results of the 26 students' responses to the questionnaire, the score of each indicator was calculated as follows. The students' satisfaction with teaching videos scored 4.81 on average. Most students favored the quality of the engineering mathematics materials in the educational videos. The quality of the learning videos was evaluated as very good (Table 3).

Table 3. Students' responses to the developed teaching videos.

Indicator	Score	Response Category
The teaching materials developed by the teacher can inspire my interest in learning	4.77	Very Good
The recorded digital video provided by the teacher helps me adjust my learning progress	4.86	Very Good
Average	4.81	Very Good

4. Conclusions

Educational videos allow students to view on-demand materials repeatedly and learn at their own pace. Furthermore, videos on YouTube can be integrated to provide targeted information and enrich the learning environment for students. In this article, tips for creating an effective video on YouTube are provided to help record and integrate a video on YouTube. It is helpful for teachers to be interested in photography and have fundamental photographic concepts. It is recommended to understand the golden ratio of contents and the ten principles of art. Teachers are encouraged to train themselves to become screenwriters, directors, and video editors. Then, recorded teaching videos can last longer. Independent recording is recommended. Creating educational videos can go on

as long as teachers enjoy the process. However, it is difficult to obtain successful results without extraordinary perseverance. The questionnaire survey result shows that students' responses to the teaching videos were excellent, with an average score of 4.81. Quality and supplementary materials are important in educational videos.

Funding: This work is supported by the Ministry of Education of Taiwan, Republic of China, through grants PEE1101210 and PEE110397.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not available.

Conflicts of Interest: The author declares no conflict of interest.

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