Chapter # 30

STUDENTS' USE OF LEARNING VIDEOS

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ABSTRACT
As digital learning grows, understanding student engagement with educational videos is essential, yet few quantitative studies exist within Norwegian educational research. This study addresses that gap by surveying over 1,400 Western Norway University of Applied Sciences (HVL) students with 252 responses to explore their video preferences, viewing habits, and perceived benefits. Results show that, while students rate external videos from elite institutions higher in technical quality, they still prefer videos made by their lecturers over hybrid teaching videos. Academic relevance stood out as the most important factor, with content quality prioritized well above other considerations like pedagogical approach, video length, and technical features. Students use videos as a general learning aid throughout the semester, not just for exam preparation, and prefer videos to be available before class, supporting flipped classroom methods. These findings suggest that educators focus on creating accessible, content-centered videos aligned with course needs to enhance student engagement and learning outcomes.

Keywords: instructional videos, video production, flipped classroom, blended learning.

1. INTRODUCTION

In recent years, the use of video as an educational tool has gained considerable popularity among students at various levels of education. This trend is primarily driven by the increasing availability of digital devices and the proliferation of online learning platforms. Video offers a dynamic and engaging way to present information, making it easier to understand and remember complex concepts. Naturally, audiovisual means (streaming, video, self-created, or accessible from the Internet) are helpful for teaching, especially with universities having multiple campuses with similar courses.

The COVID-19 pandemic has significantly affected how students learn and prepare for exams. Before the pandemic, traditional teaching methods such as classroom lectures and face-to-face consultations with teachers were prevalent. However, remote teaching became necessary during the pandemic, accelerating technology adaptation in education, including using video as one of the most important teaching tools.

An example is the Western Norway University of Applied Sciences (HVL), which has five campuses between 100 and 400 kilometers apart. Over the past eight years, studies have taken away experiences in distance learning (Fojcik et al., 2020). This research showed significant differences in video use depending on the field of study. Thus, nursing students watched videos before lectures, as predicted by the flipped classroom model (Baig & Yadegaridehkordi, 2023), at a significantly higher rate than engineering students. In contrast, engineering students often use video during their final exam preparation (Sande, Leite, & Kyte, 2021).

As time passes, the demand for flexible education is growing, with students wanting to study remotely either at their place of residence or alongside work. As a result, many universities now offer this form of education (Pollen, Fojcik, & Kampen, 2022).

How should a video be created? How does it fit into different forms and courses of study? Should the teacher deliver videos, or should students create reports and exams in video form instead of submitting written work? Proper preparation and use of these elements can help develop important soft skills such as creativity, communication, and source criticism (Poláková et al., 2023).

A meta-study (Guo, Kim, & Rubin, 2014) found that students prefer short videos, and that relevant content is more important than technical quality. Clark (1993) compares the medium to a truck delivering education: the quality of the truck is not more important than the quality of the load. Using an attractive medium does not automatically improve the learning process.

This article examines what HVL students think about watching videos in their learning process, including advantages and disadvantages. The study aims to understand how students use video content for learning, identify key parameters that make educational videos effective, and understand students' expectations of such resources. By analyzing these aspects, we can gain insights into students' preferences and behaviors, which can contribute to developing more effective educational video materials. Understanding these factors is crucial for educators, content creators, and academic institutions that want to use video as a powerful tool to improve students' learning experiences. The survey was conducted in the spring and fall of 2024.

2. RELATED WORKS

Due to the demands of modern, tech-savvy students and the availability of technology, higher education institutions need to transform traditional teaching methods (Moussiades, Kazanidis, & Iliopoulou, 2019). Developing software tailored to teaching (such as various types of LMS or audio-video programs, Zoom, Teams, Google meetings, ...), infrastructure, and data transmission systems (Ndjuluwa, Adebisi, & Abdulsalam, 2024) have facilitated new technologies. Video is also gaining popularity in the educational landscape. It is recognized that video can bring theoretical concepts to life with vivid images and spark students' imagination (Abdous & Yoshimura, 2010; Chan, 2010; Pelton, 2013). Therefore, teachers in schools and universities are increasingly encouraged to use video instruction in teaching and to develop students' learning skills through video. Empirical research on the use of video indicates that video is a powerful medium for presenting learning materials, demonstrating experts, delivering and repeating lectures, and exploring complex scenarios (Berk, 2009; Moussiades et al., 2019). As a result, most universities have begun to combine live teaching with various digital approaches, representing a blended or hybrid teaching perspective (Islam, Sarker & Islam, 2021). Video-based learning (VBL) is integral to blended learning, especially in flipped classrooms and MOOCs (Massive Open Online Courses).

According to de Boer (2013, p. 17), the development of digital networks such as the Internet has made it possible to watch video at any time, regardless of schedule. It has also led to a particular teaching detachment from a specific location (i.e., the classroom). Video can be viewed on any computer connected to the Internet. Siemens, Gasevic and Dawson (2015, p. 205) refer to this as “the idea of classroom constraints, where teachers can now use different technologies and collaborate with students and content around the world.” This, in turn, has led to opportunities outside the classroom with the advent of MOOCs (Fox, 2013;

Baggaley, 2014) and is leading to a transformation of the educational landscape (Bates, 2015).

It is not easy to imagine modern teaching without video elements (Andrist, Chepp, Dean, & Miller, 2014), which allow students to engage with the material before class at their convenience. On the other hand, using digital elements such as video content is not limited to students engaging in independent study, i.e., watching a particular video at their own time and pace. Digital elements are also used for formal teaching. The fact that video can also be integrated into face-to-face sessions means that the use of video is not limited to an add-on component (Andrist et al., 2014).

Various videos have been produced in the education sector, each with its own aspects and functions. Categorizing, describing, and defining the differences between the different forms is a complex process, and due to the dynamic nature of the field, it is constantly evolving. Changes are necessary for lecturers moving from face-to-face teaching to video instruction with screen processing. How to do this effectively while keeping the focus on the teaching process without getting lost in the complexity of new technologies is an ongoing challenge. For some lecturers, it may seem controversial to record their classes on social media and make them available to a broader audience. However, it is highly likely that video instruction will become more standard over time (Woolfitt, 2015).

Shephard (2003, p. 295) noted more than two decades ago that "video has been used in a variety of ways over the years to support student learning in all branches of education." Access to websites such as YouTube, Facebook, TeacherTube, and others has improved significantly in recent years, and most of them are freely available to students and faculty. There are also several specific videos created for our educational purposes, made by academics and with the same intent as ours, to explore the use of self-produced videos for students. There are examples of video use that are evaluated in learning and teaching in higher education, as Shephard (2003) noted.

Mitra, Lewin-Jones, Barrett, and Williamson (2010) studied students' perceptions about the use of video in lectures and seminars to assess whether video can enhance student learning and encourage critical engagement with topics. The results are based on the opinions of 134 students and 20 semi-structured interviews. Some results point to the importance of lecturers clearly describing the purpose of watching videos and using it to elicit reflection and/or discussion, making it less likely that students will remain passive. The lecturer needs to state the tasks clearly before watching the video. How lecturers use videos will determine whether it is an effective learning tool. Video can be essential in higher education when used critically and as part of a blended learning approach.

Most existing research in this area has often focused on the lecturer's perspective and experience of appropriate technology use (Cook-Sather, 2003; Lee & Sharma, 2008). Guo et al. (2014) found that videos should be short, around 6 minutes, and that content, rather than technical quality, was most important to students.

Gedera and Zalipour (2018) stressed the importance of constructing interactive videos that build on interactive learning moments where deep learning occurs. Interactive video allows students to participate actively in the learning process. To create interactive video learning moments, it is essential to provide an explanatory understanding of the content, ask questions about it, and encourage students to discuss and reflect. Iskru and Schulz (2020) wrote an article about the importance of defining what is seen as video learning. Video learning stems from students' cognitive engagement in meaningful learning experiences in which they interact with the material and learn to construct their knowledge. The student's ability to apply new information to solve a problem in a different, related context is seen as an academic achievement. The teacher's role is first to create conditions in which the student's

old knowledge is supplemented with new knowledge and, secondly, to help the student discover their full potential. Mayer (2008) and Wischgoll, Pauli, and Reusser (2019) write that what is essential for effective learning is the activation of the student's cognitive processes and that this cognitive activation takes place in an environment where it is not dangerous to make mistakes but an opportunity to learn with and from each other (Stanford, 1977).

Masats and Dooly (2011) focus on using video cases in teacher education, which can be divided into three categories depending on how the video was used: video viewing, video modeling, and video coaching. Özkan (2002) had a similar idea about using video cases in teacher education. Video viewing often focuses students' and teachers' attention on specific subjects, providing a basis for classroom assignments and discussions. Video modeling is a means to concentrate student-teacher attention on target skills or behaviors. Video coaching refers to using collected activities that lead to group discussion.

Research shows that teachers who incorporate technology to create videos for use in teaching provide essential information for the overall development of future teachers (Cullen, 1991). Research also indicates that students trained in technology/video construction will use this knowledge in their teaching situations (McKinney, 1998; Goldsby & Fazal, 2012). Achieving constructed knowledge, developing reflective skills, and creating critical video producers are essential.

3. METHODOLOGY

This section outlines the research design, participant demographics, survey methods, and analytical strategies used to examine educational video use at HVL.

3.1. Study Design

We employed a mixed-methods approach using a cross-sectional survey to gather quantitative data from structured questions and qualitative data from open-ended responses. This approach enabled us to comprehensively explore student attitudes and behaviors related to educational video use. The survey targeted specific dimensions of video engagement, including preferences for video length, the importance of technical features such as subtitles, and the timing of video consumption.

The study focused on three key aspects of video usage: the timing of video consumption (whether students watch videos before class, after lectures, or throughout the semester), engagement with video content (preferences for video length, subtitles, and quality), and content type (preferences for lecturer-made versus external videos). These variables aligned the study with the core objective of understanding how video features and usage patterns support student learning at HVL.

3.2. Participants

The survey targeted 1,404 HVL students. Participants ranged in age from 18 to over 40, with a gender distribution of 60% male and 40% female. The sample included students from various academic levels across programs such as Electronics, IT/Computer Engineering, Technology, and Nursing. Students from the Førde, Haugesund, and Bergen campuses, including on-campus and distance learners, were represented.

3.3. Survey Questionnaire

The questionnaire, administered via the SurveyXact platform, consisted of 30 questions designed to gather data on student video usage - the questions aimed at collecting information on the frequency of video use, content preferences, and quality. Multiple-choice questions assessed preferences for different video sources, such as instructor-made videos and those from external platforms. Yes/no questions addressed basic usage patterns and general opinions on videos as a teaching tool. In contrast, open-ended questions provided insights into preferences related to video features, such as the importance of subtitles.

Modifications from previous surveys included adding new questions and refinements based on earlier feedback. These adjustments allowed for a more detailed exploration of how students engage with video content in their learning process.

3.4. Data Collection

Data was collected during the Fall 2024 semester using SurveyXact. The survey link was distributed through Canvas, the university's learning management system (LMS). To boost participation, reminders were sent through the LMS. A convenience sampling approach was used to gather responses from a diverse range of students across different programs and academic levels. The survey achieved a response rate of 18%.

3.5. Data Analysis

Data analysis primarily relied on exploration and visual methods to identify response patterns. Descriptive statistics, including percentages, means, and standard deviations, were used to summarize the data. At the same time, visualizations such as histograms and box plots highlighted key trends to provide an intuitive understanding of video usage preferences. When relevant, missing data were labeled as "uncertain" responses. The analysis was conducted using Excel.

3.6. Ethical Considerations

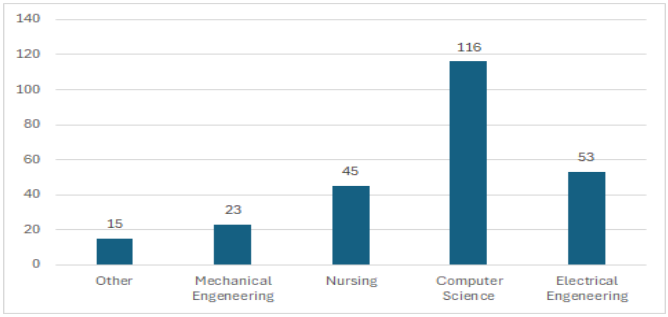
The study was reported to the Norwegian Agency for Shared Services in Education and Research (SIKT), reference number 639645. As the questionnaire also included open-ended questions, SIKT required that the project have routines for removing any personal data appearing in free text fields continuously and within one month at the latest. This was done. Thus, the project did not process data that could identify individuals directly or indirectly. SIKT, therefore, stated that the project did not need an assessment from Data Protection Services and discontinued further follow-up of the project.

Higher age ranges were grouped to ensure anonymity during the analysis process, and programs with few respondents were merged. Data is securely stored with restricted access to the research team for potential future analysis in compliance with ethical standards.

4. RESULTS

The y-axis shows the number of students in all the figures below except Figure 8, which shows points. Most of the students who answered the survey were bachelor students: 113 in their third year, 76 in their second year, and 60 in their first year. 164 out of 252 students (65%) work while studying. 97% of the students watch videos as part of their learning process. 76.7% of the students attend classes; the rest opt out of meeting in person.

Figure 1.
Students and field of study.



All the respondents watch videos, but to a varying degree. When asked how many hours they watch videos weekly, 22% of the respondents watch between 1 and 3 hours, 34% between 3-6 hours, and 23% between 6-12 hours. Most respondents (65.5%) prefer videos made by their professor, and 12.3% want a recording of entire lectures. The rest of the respondents are uncertain or prefer videos from other universities/other sources.

Figure 2.
To what extent are the videos used?

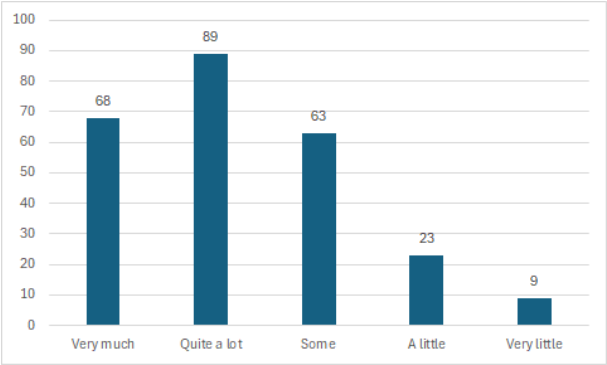
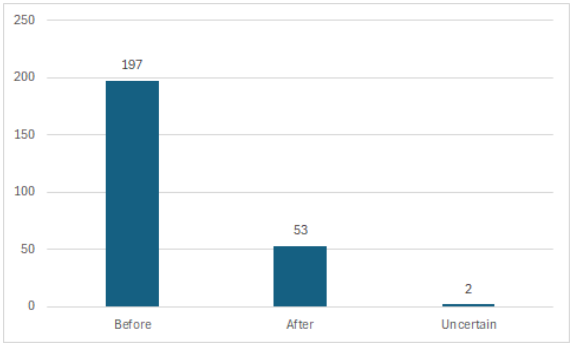
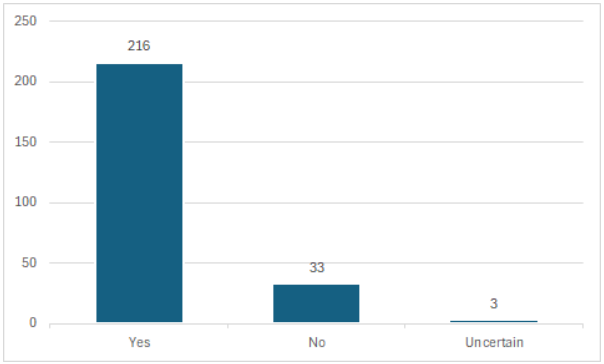


Figure 3.
Should videos be added to the LMS before or after class?



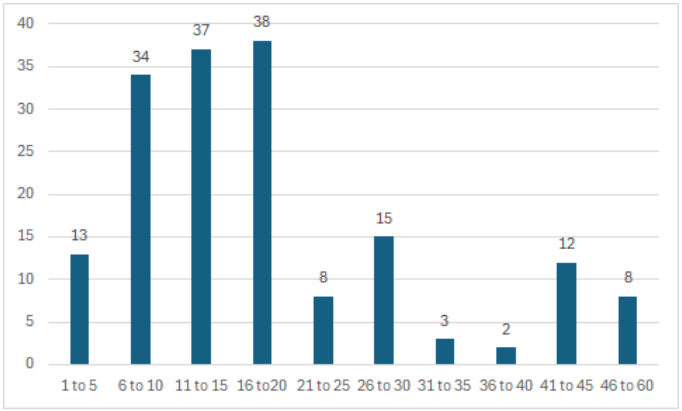
Approximately 80% of the respondents want videos available before classes. When asked whether they watch videos before or after lectures, 21 respondents answered before, 60 after, and 169 both before and after.

Figure 4.
Do you use videos throughout the semester?



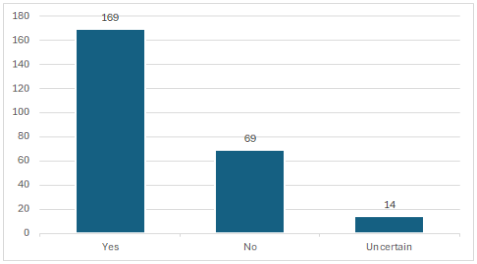
86% of the respondents watch videos throughout the semester. When questioned whether they watched the entire video, 187 respondents answered yes, and 61 answered no.

Figure 5.
Opinions on how long a video should be in minutes.



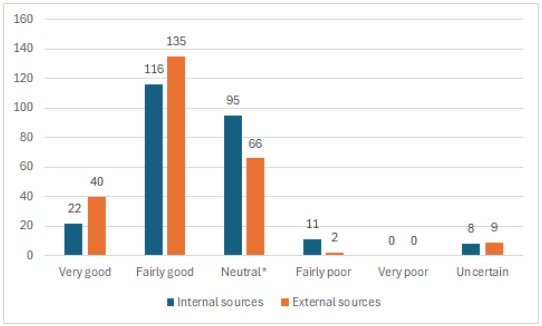
Approximately 52% of the respondents believe the video should be between 6 and 20 minutes long. 19% are uncertain.

Figure 6.
Should the videos be subtitled?



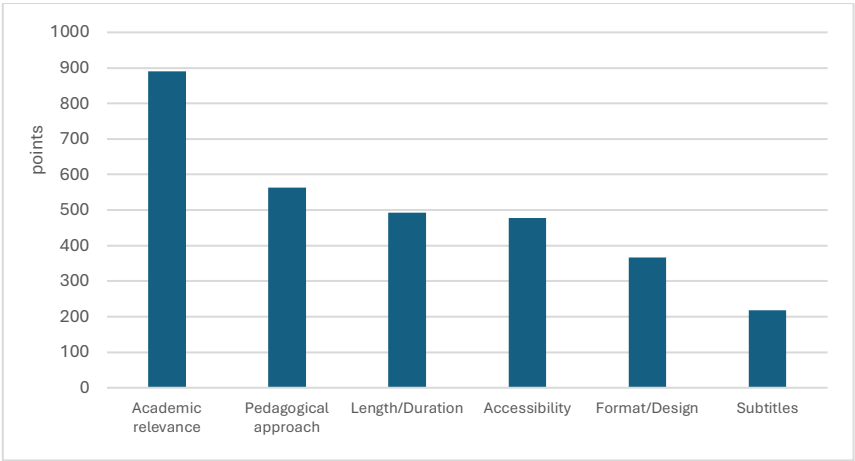
67% of the respondents want subtitled videos. 127 respondents want Norwegian subtitles, 21 want English, and 96 want both languages.

Figure 7.
Opinions on video quality.



We see that the respondents think the quality of the videos from internal and external sources is satisfactory. However, videos from external sources have slightly better scores.

Figure 8.
What is most important when watching a video?



Students gave their priorities (1-6) for different aspects of the video. We used the Borda count [Wikipedia, 2024] system and processed the questions, assigning 5 points for first place, 4 for second place, and so on. The results show that academic relevance is by far the most important. Next is a pedagogical approach, followed immediately by *length* and *accessibility.*

On the question, "Would you like to submit video assignments?" 170 (67.5%) of the respondents answered no, 62 (24.6%) respondents yes, and 20 respondents did not know.

5. DISCUSSION

The meta-survey (Guo et al., 2014) showed that students wanted short video clips and that relevant content was more important than technical quality (Clark, 1993). This finding is supported by the fact that the content is most important, not the packaging. The survey by Guo and others was conducted 10 years ago and much has changed since then.

Students today expect that there are videos available that can be used to support their learning process. It is an important part of the flipped classroom (Baig & Yadegaridehkordi, 2023). Our survey shows that the students use several different learning resources, from textbooks and online resources to materials made by their teacher. Most students watch videos in their learning process, but at different times. The idea behind the flipped classroom is that the students should prepare before they come to class (Baig & Yadegaridehkordi, 2023), but this happens to varying degrees.

The students believe that the content is essential, but set demands for sound and subtitling. If you use a good microphone so that the sound is good, the first recording is usually good enough and does not need to be edited. This means that you do not need to spend much time creating technically perfect videos, but rather spend time creating good educational content. A student states, "the video could well be a recording of a calculation with pen and paper" (freely translated from Norwegian).

Mitra et al. (2010) conducted a similar study on students' perceptions of video use. The teacher should clearly describe the purpose of watching the video and how it should be used. This may engage the students and prevent them from becoming passive. The teacher must specify tasks before watching the video. Our survey shows the importance of making video resources available in the LMS before teaching sessions, even though not all the students watch them immediately.

Iskru and Schulz (2020) discuss the importance of specifying what is perceived as learning through video. Video learning results from students' cognitive engagement in meaningful learning experiences where they interact with the material and learn to construct their knowledge. The student's ability to apply new information to solve a problem in another related context is perceived as an academic achievement. Mayer (2008) and Wischgoll et al. (2019) state that what is essential for promoting effective learning is that the teaching activates the student's cognitive processes and that this cognitive activation takes place in an environment where it is not dangerous to make mistakes, but instead used as an opportunity to learn with and from each other (Stanford, 1977). Although our survey wants to learn more about the students' use of video resources, our underlying aim will be to use their cognitive abilities and processes, such as perception, thinking, learning, problem-solving, and attention.

The students think the videos should be subtitled, as some speak indistinctly, and it is not always easy to understand different dialects. Subtitles in both Norwegian and English are desired. English subtitling is very good using YouTube, but Norwegian text recognition has

been poor up until now. Norwegian is a small language, but better AI tools are now on the market, so adding Norwegian subtitles today requires minimal extra work.

The students can watch videos longer than the recommended length of 6 minutes (Guo, et al., 2014). Videos can be indexed so that you can fast-forward to what you seek. They prefer videos made by subject teachers, but also videos they find online. In higher education, you must acquire not only subject competence but also so-called soft skills, such as creativity, the ability to communicate, the ability to collaborate, the ability to exercise source criticism, and persistence (Poláková et al., 2023). Learning requires determination and is time-consuming, as it is individual how long it takes to acquire new skills. This means that the length of the video is not decisive, but it must be easy to find what you want to see.

A survey at our university before the pandemic showed a difference between the student groups (Sande et al., 2021) in engineering and nursing education. The nursing students watched videos beforehand, as is the intention of the flipped classroom, while the engineering students watched the videos after the lecture. Our survey shows that the students now, after the pandemic, when they got used to video and video recording of lectures, watch videos to a much greater extent before the lectures.

Approximately 25% of students want to make a video for work requirements. The use of videos is an integral part of lifelong learning (Sullivan, Fulcher-Rood, et al. 2019), and colleagues in a workplace must also teach each other. Competence in making good videos becomes essential; they should learn that during their education. Therefore, we should introduce video submission as a work requirement in some subjects. It also means that the students should be instructed on making good videos and which tools they can use.

6. CONCLUSION

Our survey shows that students use video resources actively in their learning process. Videos made by teachers are good enough; they do not have to be perfect. They want the videos to be available to them before class, which can make the flipped classroom work as intended. The students point out that the content of the video is the most important, and then the way the teacher presents the material. We have been focusing on making short videos, which is less important than we thought. Our students do not want to make videos as submissions, and they prefer to use written work instead. We must work on it, teach them how to make videos, and thus try to inspire them that way. The student responses are a great inspiration for us to continue facilitating learning by creating digital learning resources.

REFERENCES

Abdous, M., & Yoshimura, M. (2010). Learner outcomes and satisfaction: A comparison of live video-streamed instruction, satellite broadcast instruction, and face-to-face instruction. *Computers & Education*, *55*(2), 733-741. doi:10.1016/j.compedu.2010.03.006

Andrist, L., Chepp, V., Dean, P., & Miller, M. V. (2014). Toward a video pedagogy: A teaching typology with learning goals. *Teaching Sociology*, *42*(3), 196-206.

Baggaley, J. (2014). MOOC postscript. *Distance Education*, *35*(1), 126-132.

Baig, M. I., & Yadegaridehkordi, E. (2023). Flipped classroom in higher education: A systematic literature review and research challenges. *International Journal of Educational Technology in Higher Education*, *20*(1). doi:10.1186/s41239-023-00430-5

Bates, A. W. (2015). *Teaching in a digital age: Guidelines for designing teaching and learning*. BCcampus.

Berk, R. A. (2009). Multimedia teaching with video clips: TV, movies, YouTube, and mtvU in the college classroom. *International Journal of Technology in Teaching & Learning*, *5*(1).

Chan, Y. M. (2010). Video instructions as support for beyond classroom learning. *Procedia - Social and Behavioral Sciences*, *9*, 1313-1318.

Clark, M. C. (1993). Transformational learning. *New directions for adult and continuing education* (57), 47-56.

Cook-Sather, A. (2003). Listening to students about learning differences. *Teaching Exceptional Children*, *35*(4), 22-26.

Cullen, R. (1991). Video in teacher training: the use of local materials. *ELT Journal*, *45*(1), 33-42.

de Boer, J. (2013). Learning from video: viewing behavior of students (Doctoral dissertation, University of Groningen, The Netherlands) https://doi.org/10.33612/diss.14427156

Fojcik, M., Fojcik, M. K., Hegland, P. A., Kyte, L., Midtbø, T. G., Pollen, B., ... & Sande, O. (2020). Praktisk digitalisering av høgskuleundervising: –erfaringar frå forelesarar og studentar. [Practical digitalization of college education: – experiences from lecturers and students]. In Digital samhandling: Fjordantologien 2020 (pp. 321-335). Universitetsforlaget.

Fox, A. (2013). From MOOCs to SPOCs. *Communications of ACM*, *56*, 38-40.

Gedera, D. & Zalipour, A. (2018). Use of interactive video for teaching and learning. In M. Campbell, J. Willems, C. Adachi, D. Blake, I. Doherty, S. Krishnan, S. Macfarlane, L. Ngo, M. O'Donnell, S. Palmer, L. Riddell, I. Story, H. Suri & J. Tai (Eds.), *Open Oceans: Learning without borders. Proceedings ASCILITE 2018 Geelong* (pp. 362-367).

Goldsby, D.S. & Fazal M.B. (2012). Technology's answer to portfolios for teachers. *Kappa Delta Pi Record*, *36*(3), 121-123.

Guo, P. J., Kim, J., & Rubin, R. (2014, March). How video production affects student engagement: An empirical study of MOOC videos. In *Proceedings of the first ACM conference on Learning@ scale conference* (pp. 41-50). New York, NY: ACM.

Iskru, V. V., og Schulz, J. (2020). How postgraduate students use video to help them learn. *Contemporary Educational Technology*, *12*(2), 276. doi:10.30935/cedtech/8400

Islam, M. K., Sarker, M. F. H., & Islam, M. S. (2022). Promoting student-centred blended learning in higher education: A model. *E-Learning and Digital Media*, *19*(1), 36-54.

Lee, K. J. & M. D. Sharma (2008). Incorporating active learning with videos: 'A case study from physics'. *Teaching Science*, *54*(4), 45-47.

Masats, D. & Dooly, M. (2011). Rethinking the use of video in teacher education: A holistic approach. *Teaching and Teacher Education*, *27*(7), 1151-1162.

Mayer, R. E. (2008). *Learning and instruction*. Upper Saddle River, NJ: Pearson.

McKinney, M. (1998). Preservice teachers' electronic portfolios: integrating technology, self assessment, and reflection. *Teacher Education Quarterly*, *25*(1), 85-103.

Mitra, B., Lewin-Jones, J., Barrett, H., & Williamson, S. (2010). The use of video to enable deep learning. *Research in Post-Compulsory Education*, *15*(4), 405-414.

Moussiades, L., Kazanidis, I., & Iliopoulou, A. (2019). A framework for the development of educational video: An empirical approach. *Innovations in Education and Teaching International*, *56*(2), 217-228.

Ndjuluwa, L., Adebisi, J. A., & Abdulsalam, K. A. (2024). A Review on Digital Tools for Engineering Postgraduate Education in post-Covid Era. *Adeleke University Journal of Engineering and Technology*, *7*(1), 222-235.

Özkan, B. (2002). The Use of Video Cases in Teacher Education. *The Turkish Online Journal of Educational Technology – TOJET*, *1*(1).

Pelton, J. A. (2013). Seeing the theory is believing" writing about film to reduce theory anxiety. *Teaching Sociology*, *41*(1), 106-120.

Poláková, M., Suleimanová, J. H., Madzík, P., Copuš, L., Molnárová, I., & Polednová, J. (2023). Soft skills and their importance in the labour market under the conditions of Industry 5.0. *Heliyon*, *9*(8), e18670.

Pollen, B., Fojcik, M., & Kampen, A. L. (2022). Laboratory exercises in electronics engineering education–evaluation of physical and digital form. In EDULEARN22 Proceedings (pp. 1757-1764). IATED.

Wischgoll, A., Pauli, C., & Reusser, K. (2019). High levels of cognitive and motivational contingency with increasing task complexity results in higher performance. *Instructional Science*, *47*(3), 319-352.

Sande, J., Leite, I., & Kyte, L. (2021). Self-produced videos in a flipped classroom for engineering students and nursing students. In M. Carmo (Ed.), Education Applications & Developments (vol.VI, pp. 223-235) Lisbon, Portugal: inScience Press.

Shephard, K. (2003). Questioning, promoting and evaluating the use of streaming video to support student learning. *British Journal of Educational Technology*, *34*(3), 295-308.

Siemens, G., Gašević, D., & Dawson, S. (2015). *Preparing for the digital university: A review of the history and current state of distance, blended and online learning*. Retrieved from https://eddl.tru.ca/wp-content/uploads/2018/12/PreparingDigitalUniversity-George-Siemens.pdf

Stanford, G. (1977). *Developing effective classroom groups*. New York: Hart Publishing.

Wikipedia, (2024). *Borda count - Wikipedia*. Retrieved from https://en.wikipedia.org/wiki/Borda_count

Woolfitt, Z. (2015). The effective use of video in higher education. *Lectoraat Teaching, Learning and Technology Inholland University of Applied Sciences*, *1*(1), 1-49.

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