# Teaching Through TikTok, YouTube, and Moodle: The Instructional Design and Learner Engagement of Educational Nano-Videos

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## Abstract

This study examined the use of educational nano-videos (short instructional video clips) ranging in length from 1 to 2½ minutes. Using a mixed-methods survey design in two rounds, data was collected from students across asynchronous and face-to-face delivery modes. The impetus for this study was influenced by cognitive load theory (Sweller et al., 1998), wherein our investigation assessed how minimalist instructional video design can enhance learner engagement by reducing extraneous information and enhancing content retention. Centred on the learner experience, students evaluated the videos and were asked about their preferred video platforms, ideal video length, and their perception of the effectiveness in reaching the learning outcomes. For preferred platforms, results showed a preference for YouTube in the face-to-face delivery section, while in the asynchronous classes, there was a preference for the video platform in the university's learning management system (Moodle). Results also showed a preference for videos between 90 seconds and 4 minutes in length. The majority of respondents assessed the videos on a Likert scale from "not effective" to "very effective" in achieving learning outcomes. The qualitative feedback highlighted the importance of the video's pace, clarity of fonts and colours, and limiting the video's background music in video segments when dealing with complex material. The study's findings highlighted the value of minimalist and clear nano-videos as a pedagogical tool necessary for today's digitally engaged learner.

Keywords: nano-videos, cognitive load theory, learner engagement, microlearning, universal design for learning (UDL)

## Introduction

The impetus for using educational nano-videos stems from the recommendations in the implementation of the new Universal Design for Learning (UDL) 3.0 principles (Centre for Applied Special Technology [CAST], 2024). UDL is an approach to inclusive education that enhances students' engagement with instructional materials through the intentional pedagogical design of multiple means of *engagement* and *representation* of course content. The first UDL

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principle, “multiple means of engagement,” was utilized in this study by focusing on how to design learning materials that were “socially and personally relevant media to learners’ lives,” which, in turn, increases relevance and engagement between the video and the student’s prior learning (CAST, 2024). The second UDL principle utilized was “multiple means of representation,” which can include font and size of text in handouts, colours of lecture slides, and audio elements. Applied to this study, multiple means of representation were considered by examining the different video elements learners preferred. In short, these UDL principles led us to explore the explicit *what and how* that made educational nano-videos engaging from the learner’s perspective. These videos are a medium with which many students are already familiar with in online learning (engagement), and by leveraging concise and clear visual and auditory elements (representation), the videos were able to garner high engagement from students in both study groups.

## Literature Review

*Research Question #1*: *How do learners’ preferences for nano-video depend on the media platforms (TikTok, YouTube, Class LMS)?*

While there is wide range of student and instructor video length preferences when it comes to videos on learning management systems (LMS) like Moodle, social media shows a new set of opportunities and challenges for understanding the pedagogical merit of nano-videos. There is emerging evidence that suggested nano-videos on TikTok increased microlearning engagement (Conde-Caballero et al., 2023). Compared to TikTok, YouTube is the more well-established social media video site, which has already been widely used in educational settings; however, unlike traditional learning resources such as textbooks & course packs, many social media sites—including YouTube—contain videos that lack a standardized quality assurance or peer-review process, posing a significant concern for many educational users (Greeves & Oz, 2023).

*Research Question #2*: *What is the preference for the length of a nano-video?*

An important aspect of UDL emphasizes that course concepts are delivered in a clear, scaffolded structure, which is strongly aligned with the principles of cognitive load theory. According to Sweller et al. (1998) and Skulmowski and Xu (2021), cognitive load theory suggests that learners always operate under constraints of working memory. Applied to nano-video instructional design, these constraints suggest that ultra-short videos should minimize unnecessary visual/audio clutter (or extraneous information) and instead present video content in simple, small segments that can slowly (but more clearly) build to develop a semantic network of the course content. These clear and succinct segments, Khlaif and Salha (2021) argued, help distinguish nano-learning from simply “watching a video,” as nano-learning involves condensing content into smaller conceptual units that are controlled and clearly delivered to achieve an intentional learning objective. While specific video length is dependent on a myriad of factors, a comprehensive study by Manasrah et al. (2021) found that undergraduate engineering students preferred videos ranging from 6 (minimum) to 10 (maximum) minutes.

*Research Question #3*: *How effective are nano-videos in linking key concepts with learning outcomes?*

Aburizaizah and Albaiz (2021) found that delivering course concepts in small, focused components, such as nano-videos, can increase learners' understanding of course learning outcomes. Largely influenced by today's social media and digitally literate student demographic, nano-videos are part of a larger trend of microlearning (segmented, short learning sessions), as compared to the longer and continuous class lectures (sometimes three or more hours in length). When microlearning is integrated with relevant digital elements through relevant online platforms (for example, UDL principles of engagement and representation), it can significantly enhance student motivation, performance, and interaction (Silva et al., 2025).

Grounded in both the UDL guidelines and cognitive load theory, the above literature review motivated us to examine the extent of the learners' preference in relation to delivery platform, as well as the preferred length of a nano-video for both asynchronous and in-class learners. We were also motivated to discover how effective nano-videos are for the learner and what characteristics made them effective. Ultimately, the study's findings aim to provide post-secondary educators with instructional insights into how to effectively structure, package, and teach with nano-videos to maximize learner engagement.

**Inquiry into Video Characteristics (Platform and Length)**

One goal of this study is to examine the preferred platform for accessing and viewing these nano-videos. Giesen et al. (2021) suggested students have a strong preference toward YouTube as a video distribution platform, which contributed to increased engagement with instructional video content.

The study also examined the preferred length of nano-videos and short videos. While nano-videos on both YouTube and TikTok are typically between 1 to 3 minutes, Manasrah et al. (2021) found that engineering students considered information in videos shorter than 3 minutes to be insufficient and incomplete, especially due to the mathematical complexity of the course topics. The results of the Manasrah et al. study suggested that the optimum length for a lecture or tutorial video is between 6 and 10 minutes for undergraduate courses. Thus, in keeping with the nano-video principle of mirroring microlearning students found on media platforms, we decided that a shorter video length would be appropriate to experiment in the context of our study.

Overall, the effectiveness of educational nano-videos is promising: Lancellotti et al. (2016) conducted quasi-experimental research with 479 students in their undergraduate classes. They prepared 75 video modules, each lasting 4 to 6 minutes. After comparing students who watched the short instructional videos with those from the previous semesters, they found a significant improvement in student achievement on the summative assessment. Furthermore, they noted that the short videos allowed students to focus on conceptual understanding and review them repeatedly, thereby developing long-term working memory through reinforcement learning.

## Methodology

Prior to this study, an informal beta-survey was piloted with an earlier cohort of students to see whether the survey design needed any changes. During this initial pilot, each question was presented, and learners were invited to comment on clarity and overall comprehensibility. Feedback indicated that the survey questions were understandable and appropriately phrased, requiring only minor edits.

In this study, after students engaged with the nano-videos (see Appendix), surveys were distributed in both face-to-face and asynchronous online classes.

The online, anonymous student survey comprised four questions with distinct response formats. Two items captured respondents' preferences (e.g., preferred video length and delivery modality) using categorical options. One item assessed perceived effectiveness of nano-videos on a four-point Likert scale (1 = Not effective, 2 = Somewhat effective, 3 = Effective, 4 = Very effective). The final item was an open-ended qualitative question, inviting participants to provide qualitative comments on their experience with nano-video learning. This combination of closed- and open-ended questions allowed for both quantitative analysis of patterns and qualitative insights into learner perspectives.

The survey data was gathered in two separate, distinct rounds. The first round took place in the Fall semester of 2024, and the second round occurred in the Winter semester of 2025. The survey maintained consistency across all variables and questions in both rounds, aligned with best practices for longitudinal research (Bala, 2020). Longitudinal research designs are often thought of as multi-wave, time-structured studies, with all participants providing a measure at different rounds or waves (McNeish & Matta, 2018). The logistics of the two separate rounds are detailed below. All survey results—regardless of which round—came from MacEwan University's Bachelor of Commerce students enrolled in a mandatory introductory managerial accounting course. In all the classes and rounds, the students had the same faculty teaching them.

In the first round, the survey was circulated to 100 students enrolled in an asynchronous version of the above-mentioned course. These 100 students were from two separate classes, each with 50 students enrolled. The response rate to this survey was 63%, or 63 out of the 100 students. In the second round, the identical survey was circulated to 80 students enrolled in the same course but in a traditional face-to-face class format. In the face-to-face survey group, the response rate was 71%, or 57 students out of 80 students. The teaching faculty asked students to complete this electronic survey located on their course page. According to Saleh and Bista (2017), students prefer completing electronic surveys received from school authorities they know as opposed to school authorities they don't know. In the first and second rounds, the response rates for both asynchronous and face-to-face classes exceeded 60%.

**Preliminary Findings**

The tables below present some of the key findings from both rounds. Table 1 correlates with research question number #1 regarding platform preferences.

*Table 1. Question 1: Which platform do you prefer for short videos?*

| | **Round One** | **Round Two** |
|---|---|---|
| **Delivery Mode** | **Asynchronous Class** | **Face-to-Face Class** |
| **TikTok** | 11.1% | 0% |
| **Moodle/Class Webpage** | 38.1% | 35.1% |
| **YouTube** | 28.5% | 47.37% |
| **Indifferent** | 22.3% | 17.53% |

For the face-to-face class, Table 1 shows a stronger preference for YouTube over TikTok. This may be why Greeves and Oz (2023) found that YouTube is widely used in educational settings. Features such as the ability to pause, replay, adjust playback speed, and access subtitles allow learners to control their study pace effectively—which exemplifies the vital role of autonomy in keeping the format engaging. Additionally, coupled with meaningful digital and information literacy skills, YouTube's vast array of content from reputable channels, such as Khan Academy and Crash Course, provides learners with what they perceive to be reliable educational resources on demand, almost standing in for the validity of peer review seen in traditional learning formats. The asynchronous class's preference for the Moodle/Class Webpage is further discussed in the Conclusion section.

Table 2 correlates with the research question #2 regarding the preferred length of nano-videos. The responses to this question are detailed below in Table 2.

*Table 2. Question 2: What is your preference for the length of the nano-video?*

| | **Round One** | **Round Two** |
|---|---|---|
| **Video Length** | **Asynchronous Class** | **Face-to-Face Class** |
| **1 Minute or Less** | 14% | 30% |
| **Approximately 90 Seconds** | 24% | 28% |
| **Approximately 2 Minutes** | 24% | 19% |
| **Approximately 2–4 Minutes** | 21% | 18% |
| **Approximately 4–6 Minutes** | 11% | 5% |
| **Over 6 Minutes** | 6% | 0 |

For preferred video length, the asynchronous class in Round 1 is somewhat evenly distributed between 90 seconds and 4 minutes. The preference for shorter videos aligns with earlier research by Sweller et al. (1998), which indicates that learners operate under the constraints of working memory. The face-to-face class of Round 2 shows a range of preferences from less than 1 minute to a maximum of 4 minutes. While some respondents may prefer a duration of 4 to 6 minutes, it appears that very few, if any, want the nano-video to exceed 6 minutes. This finding aligns with a similar study by Khlaif and Salha (2021), which demonstrated a preference for concise short videos. Similar studies suggested that nano-learning videos are most effective for students when the length is between 2 and 5 minutes, as this duration supports cognitive processing while maintaining engagement effectively (Yousef et al., 2023). In part, our findings align with this; however, it is worth noting that in the face-to-face class, 58% of the respondents preferred nano-videos of 90 seconds or less. The rationale for this may be that face-to-face students view nano-videos as a supplement to the already existing in-class lectures; therefore, longer detailed videos are not necessary. Further research could explore how the undergraduate engineering students in the Manasrah et al. (2016) study, as mentioned in the literature review, preferred videos in the range of 6 to 10 minutes and whether the respondents' demographic/field of study (engineering versus commerce) had any effect on their responses.

The instructional videos made available to learners varied in duration from approximately 1 minute to 2 minutes and 40 seconds. Nine nano-videos were made available to the learners. To evaluate preferences regarding video length, the survey included options exceeding these durations, aiming to determine whether learners, having become accustomed to shorter videos, would have favoured longer formats.

Another survey question pertained to the effectiveness of the nano-videos. Research question #3 asked how effective nano-videos are in linking key concepts with learning outcomes. The survey responses, as identified in Table 3 below, provide insight into this.

*Table 3. Question 3: How effective did you find the short videos in helping you learn a concept that was linked to a course learning outcome?*

| | **Round One** | **Round Two** |
|---|---|---|
| **Effectiveness** | **Asynchronous Class** | **Face-to-Face Class** |
| **Very Effective** | 27% | 38.6% |
| **Effective** | 46% | 54.4% |
| **Somewhat Effective** | 25% | 7% |
| **Not Effective** | 2% | 0 |

The results above suggest that overall, the nano-videos were effective in linking the conceptual learning in the video to the intended learning outcomes. This aligns with Aburizaizah and Albaiz (2021), who found that delivering micro-content in small, focused components, such as nano-videos, can help students more readily achieve learning outcomes. It is important to note that the asynchronous class showed 25% of the respondents indicated that the nano-videos were "somewhat effective." This is discussed further in the Conclusion section. We plan to continue surveying and collecting responses in future face-to-face and asynchronous courses. Once our responses reach a critical mass, a cross-tabulation will be completed.

The only qualitative question in the survey asked, "*Are there any suggestions you have towards making the videos more helpful?*" Findings from this question reveal that common themes emerged in each round and across all classes. In saying such, there were also themes that were only common in a respective round and/or class type. Table 4 below provides a summary of the qualitative responses, which were thematically coded using grounded theory methodology and iterative coding practices (Williams & Moser, 2019). In round one, of the 63 students in the asynchronous class who submitted their survey, only 37 responded to this question. In the face-to-face class, only 20 students out of 57 respondents answered this question in the second round.

*Table 4. Qualitative Question: Do you have any suggestions for making the videos more helpful?*

| | **Round One** | **Round Two** |
|---|---|---|
| **Theme** | **Asynchronous Class** | **Face-to-Face Class** |
| **Theme #1: Background music was nice, but for complex topics, use the professor's voice-over** | ✓ | ✓ |
| **Theme #2: Slow down the pace** | ✓ | ✓ |
| **Theme #3: Videos could be a bit longer (Note: Videos used were one to two minutes in length)** | ✓ | ✓ |
| **Theme #4: Fonts and colours used could lead to eye strain** | | ✓ |

The consistent themes in both rounds suggest eliminating the background music for complex topics, slowing down the pace, and making the videos slightly longer. These responses align with our theoretical foundation in cognitive load theory and UDL. The videos in the study

ranged in length from 1 minute to 2 minutes and 40 seconds. Further research is needed to determine the correct combination/balance of font and colour for nano-videos.

## Conclusion

While students provided promising reviews of the effectiveness of nano-videos, further research grounded in other methodological approaches, such as practitioner inquiry or classroom action research methods, could help inform future iterations of the study that are more attuned to the contextual differences across learners in different classes and sections (Cochran-Smith & Lytle, 2009). In practice, based on student feedback, in response to the qualitative question, future nano-videos may use voice-overs, especially with complex subject matter, instead of background music.

In response to the first research question, for the face-to-face class, YouTube was preferred potentially due to its perception as a more legitimate educational platform, given that TikTok may be more of a "scroll and flow" form for personal rather than academic use, where the user is not intended to watch just one video. From the student perspective, TikTok may lack the perceived depth and academic validity perceived in YouTube's content. For both asynchronous and face-to-face classes, it is also worth mentioning that the class webpage in Moodle had a preference of 35% to 38% of all of the responding students. This could be due to the fact that the class webpage serves as the course hub or "landing page" once students log in; thus, students may prefer the convenience and simplicity of having all media resources in one place, without needing to click on an external link to access them elsewhere. The reasoning behind platform preferences will require further research into specific media platform preferences.

In response to research question #2, our study reveals that the majority of respondents from both asynchronous and face-to-face cohorts preferred videos under 4 minutes in length, suggesting the key tenet of brevity in nano-video principles holds true when correlated to learner engagement. However, 17% of the asynchronous students and only 5% of the face-to-face students preferred videos that were over 4 minutes long.

In research question #3, the effectiveness of connecting the video to a course learning outcome was tested. It is noteworthy that 25% of the asynchronous students found the short videos to be *"only somewhat"* effective. One possible reason is that while face-to-face students saw the nano-videos as augmentative to the detail found in the in-person lecture, asynchronous students already rely heavily on media and digital resources, which could mean that having another digital resource (a nano-video) without the depth and details of the other media resources does not provide a new pathway toward achieving a learning outcome. On the other hand, students in the face-to-face classroom may view nano-videos as beneficial—as a reinforcing supplement or "added bonus" on top of their live lecture in a new medium, thus leveraging the UDL principle of multiple means of representation.

Going forward, we plan to continue surveying and collecting responses in deciphering how to best instructionally design nano-videos. Once our responses reach a critical mass, a cross-tabulation will be completed.

**How AI Was Used in This Manuscript**

Occasionally, we would prompt the AI to list references that detailed a specific point of interest or subject matter. AI was also used to make our original copy into a blind copy for peer review.

**Research Ethics Board Statement**

This study was reviewed and approved by MacEwan University's Ethics Board. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. Informed consent was obtained from all individual participants included in the study.

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**Appendix: Sample of the Nano-Videos**

**Example 1**: This video was created by the author using Articulate 360-degree software. In total, there were five of these videos. This is an example of one of them, which deals with learning how to calculate breakeven. This video is 45 seconds long. See link below:

*Calculate Break Even*. https://youtu.be/EtX8ZKi4YoM?si=fCgFOAbtUgYojDCo

**Example 2**: This video was created by the author through a generative AI software called InVideo AI. Here you provide the software with the narrative you prefer and then select a series of filters to produce a video. One challenge to note is how the software mispronounced MacEwan University. The topic in this example concerns a make-or-buy decision. It is 1 minute and 39 seconds long. See link below:

*Make In-house or Buy/Contract Out*. https://www.youtube.com/watch?v=afwmoJDW7WM