

Exploring the impact of YouTube and instructional videos on learning outcomes: A comparative study

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ABSTRACT

The YouTube platform has become a key learning tool, providing free video content. Meanwhile, with a vast video database and a platform focused on entertainment, many question whether YouTube video content aligns with pedagogical objectives. Therefore, this study aims to compare the learning outcomes of students who use YouTube videos and instructor-developed videos (IDVs) in archival management learning. Using a quantitative approach based on a quasi-non-equivalent control group design with a post-test-only design, this research focuses on test instruments to measure cognitive and psychomotor learning outcomes involving 79 students enrolled in the Records Management course at the Faculty of Vocational Studies, Universitas Negeri Yogyakarta. Data analysis consisted of normality and homogeneity tests. To determine differences between the two groups, the Mann-Whitney U test was conducted in RStudio. The results showed that 1) there was no significant difference in cognitive achievement between students who learned using YouTube videos and instructional videos, and 2) there was a significant difference in psychomotor achievement between students who learned using YouTube videos and instructional videos. This finding indicates that YouTube videos can support students' cognitive thinking; however, they have not achieved greater skill gains than videos developed with practical learning characteristics. Future studies may identify factors influencing learning outcomes in both groups to examine the extent to which instructional media use supports learning achievement, particularly in the psychomotor domain.



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INTRODUCTION

The era of online learning continues to evolve and persist even after the Covid-19 pandemic, driven by its flexibility and high adaptability, which allow students to learn anytime, anywhere. The development of MOOCs, learning management systems (LMS), and web-based platforms has also led to the emergence of various video-based learning content used in asynchronous learning (Mohamed & Shoufan, 2022). In higher education, asynchronous learning is commonly implemented by providing a series of videos for students to analyse. At the end of the learning process, students are required to conduct experiments or complete quizzes to evaluate their learning outcomes (Zull, 2002).



Video content is a key component of asynchronous learning, as it facilitates knowledge construction by delivering content in the absence of instructors in online environments (Suen & Hung, 2024). Asynchronous learning supported by video content offers cognitive benefits (e.g., learning and retention) and psychological advantages (e.g., motivation and learning attitudes). It provides clearer representations of knowledge through dual-channel coding (Gaudin & Chaliès, 2015). This is in line with Dual Coding Theory (DCT) proposed by Clark & Paivio (1991), which explains that individual process information through two systems: verbal and non-verbal (visual). The integration of visual information with verbal explanations enables the formation of stronger knowledge structures, particularly in long-term memory. Furthermore, the process of constructing knowledge through active engagement with video content aligns with the principles of experiential learning (Kolb, 1984).

However, the increasing demand for video-based content has encouraged the use of video resources beyond formal educational contexts (Christopoulos et al., 2023; Martínez et al., 2024). One of the most widely used platforms is YouTube, which provides freely accessible content for both formal and informal learning (Fikri et al., 2022). Despite its widespread use, the adoption of YouTube in educational settings remains debated, as the platform is not specifically designed to support instructional objectives (Greeves & Oz, 2023; Nacak et al., 2020).

On the other hand, videos designed specifically for learning environments, whether online or offline, must meet certain criteria to avoid imposing additional cognitive load on learners, one of which is the principle of segmenting (Lee & Tsai, 2018). This aligns with the Cognitive Theory of Multimedia Learning (CTML) proposed by Mayer (2014a), which emphasises that multimedia design (audio and visual) should aim to reduce extraneous cognitive load. In addition, Mayer (2003, 2014a, 2014b) highlights several key principles in multimedia design, including coherence, signalling, spatial contiguity, and temporal contiguity.

The coherence principle emphasises that all content presented in a video should be relevant and aligned with instructional objectives. Meanwhile, the signalling principle refers to the use of cues or highlights to direct learners' attention to essential information, thereby helping them focus on key elements of the content. Finally, the segmenting principle highlights that learning materials should be presented in smaller, manageable parts to be processed more effectively, given learners' limited cognitive capacity. These principles have been empirically shown to reduce excessive cognitive load through dual-modality design and to enhance students' learning outcomes (Candido & Cattaneo, 2025).

Given the critical role of video in supporting learning objectives, video-based content in asynchronous learning should be carefully designed in accordance with the principles of the Cognitive Theory of Multimedia Learning (CTML) (Greenberg et al., 2021). However, the increasing adoption of social media platforms such as YouTube in educational contexts has become more widespread due to their accessibility and ease of use (Roy, 2023).

Despite this, YouTube is not specifically designed to follow multimedia learning principles or to support instructional processes (Allgaier, 2019; Greeves & Oz, 2023). As a free and open platform, most video content on YouTube is primarily developed for entertainment, as it serves as a social media platform for sharing and consuming video.

The growing use of YouTube for educational purposes in higher education has attracted increasing attention from researchers. For example, a study by Guaya et al., (2024) examined integrating YouTube with a Project-Based Learning approach in higher education and found that this integration enhances student engagement and knowledge and skill development in chemical engineering. In the field of informatics, YouTube is widely used by students as a learning resource, offering a variety of instructional content, including tutorials, lectures, and demonstrations (Fergina et al., 2025). Beyond STEM disciplines, YouTube is also widely used in higher education contexts, particularly in English as a Foreign Language (EFL) instruction. Studies by Al-Mubireek (2025) and Menggo et al., (2025) show empirical evidence that the use of YouTube brings positive and significant impacts in terms of increasing students' learning autonomy, speaking skills, and improving the overall quality of learning in the EFL context. In the field of administration, Roy

(2023) found that YouTube use among Master of Business Administration (MBA) students in Bangladesh is associated with improved academic performance.

Students' perceptions of why they prefer using YouTube for learning have been explored by [Burhanli & Bangir \(2021\)](#), who found that YouTube content aligns with students' interests and learning needs, is easy to use, and helps overcome the limitations of synchronous learning in campus settings. In addition, YouTube's popularity in learning contexts is also influenced by its vast collection of video content ([Chintalapati & Daruri, 2017](#)). The platform is considered user-friendly, with simple navigation that allows users to easily search for relevant content by entering specific keywords based on their learning needs ([Fyfield et al., 2021](#); [Mohamed & Shoufan, 2022](#)).

Although previous studies have provided empirical evidence that learning through YouTube videos is accessible, engaging, and can positively impact learning performance, several researchers have raised concerns about its use in educational settings. For example, by [Ergul \(2021\)](#), [Fares et al., \(2023\)](#) and [Mohamed & Shoufan \(2022\)](#), who question whether all video content on YouTube is aligned with learning content, developed based on achieving learning objectives, or supporting the achievement of specific competencies. Meanwhile, the ranking system on YouTube prioritises views, so that people who want to learn are presented with popular videos rather than quality or learning-objective-aligned content ([Abbas et al., 2025](#)). Furthermore, free videos are also unlikely to meet the quality standards students need in the classroom ([Roth et al., 2017](#)).

In contrast to YouTube-based content, instructional videos can be generally defined as videos developed in alignment with the curriculum to support the achievement of learning objectives ([Lamontagne et al., 2021](#)). In educational contexts, such videos are intentionally designed based on the principles of the Cognitive Theory of Multimedia Learning (CTML). For instance, the signalling principle is believed to help learners focus on essential information, thereby improving the learning process ([Ragazou & Karasavvidis, 2023](#)).

Furthermore, an experimental study by [Jing et al., \(2025\)](#) examined the effects of combining visual and verbal elements (dual-modality) in videos with and without text. The findings indicate that videos with text may lead to shorter fixation duration and frequency during text processing, increased extraneous cognitive load, and reduced germane load, ultimately resulting in lower learning performance.

Another study by [da Silva & Oliveira \(2023\)](#) found that videos designed based on CTML principles can improve content quality and facilitate knowledge transfer, thereby enhancing learning outcomes. Additional empirical evidence summarised by [Hew & Lo \(2020\)](#) also indicates that self-developed videos can improve students' learning performance. These findings suggest that both Cognitive Load Theory and the Cognitive Theory of Multimedia Learning remain relevant, as they emphasise the critical role of multimedia design quality in influencing learning effectiveness ([Noetel et al., 2022](#)).

Previous studies have extensively examined the impact of video-based learning on learning outcomes, either through instructional videos developed according to CTML principles or through YouTube content. For instance, several studies have investigated the effectiveness of instructional videos ([da Silva & Oliveira, 2023](#); [Hew & Lo, 2020](#); [Ragazou & Karasavvidis, 2023](#)), consistently reporting positive impacts on teaching and learning processes. Similarly, other studies have explored the use of YouTube-based videos and found generally positive effects on learning outcomes ([Al-Mubireek, 2025](#); [Guaya et al., 2024](#); [Menggo et al., 2025](#); [Roy, 2023](#)).

However, most of these studies focus on a single type of video, either instructional videos or YouTube-based content. Direct comparisons between these two types of video remain limited, particularly in examining how instructional videos developed according to CTML principles differ from YouTube videos in their influence on learning outcomes.

Therefore, this study aims to examine the differences in learning outcomes, both knowledge and skills, between students who learn using YouTube-based videos and those who learn using instructional videos in asynchronous learning environments in higher education. The novelty of this study lies in its direct experimental comparison of these two types of videos. While YouTube content is generally not designed for instructional purposes, instructional videos are developed in line with CTML principles to support the achievement of learning objectives. The findings of this study are expected to provide a new perspective on whether educators still need to create their own

instructional videos. This is particularly important given that developing instructional videos often requires significant time, preparation, and financial resources (Fyfield et al., 2022; Xu et al., 2025).

METHOD

This study adopts a quantitative, quasi-experimental design, specifically the posttest-only nonequivalent control group design. Two groups were selected through non-random sampling by utilising existing classes enrolled in an archival management course during the 2024-2025 academic year. Therefore, the group assignment was not random. The purpose of this design is to compare learning outcomes, including both knowledge and skills, between the two groups in an asynchronous learning context in higher education. The assignment of experimental and control groups was based on pretest results (knowledge) to identify students' initial conditions.

The study population consisted of 79 students enrolled in the Archival Management course at the Faculty of Vocational Studies, Universitas Negeri Yogyakarta (UNY), during the 2024-2025 academic year. A total sampling technique was employed, in which all members of the population were included as research participants. The determination of the experimental and control groups was based on pretest results: the class with the lower mean score was assigned to the experimental group, and the class with the higher mean score was assigned to the control group (see Table 1).

Table 1. Experiment Research Design

No.	Group	Pre-Test	SD	Treatment	Posttest
1	Experiment Group	53.87	17.26	Using Instructional Videos (X ₁)	O ₂
2	Control Group	55.48	16.89	Using YouTube (X ₂)	O ₄

Source: (William & Jurs, 2009).

The experimental group received the treatment by learning through instructor-developed Digital Archival Videos, that had undergone a development process as described by (Sutirman et al., 2024). Meanwhile, the control group learned using Digital Archival Videos sourced from YouTube, selected using the keyword “alphabetical filing system.” The two top-ranked videos from the search results were chosen as learning materials for the control group (see Figure 1). In the first session, students were introduced to the experimental procedure and completed the pretest. Subsequently, students engaged in independent learning from the second to the fourth sessions using the LMS platform. Skill assessment was conducted through independent practicum tasks, while cognitive outcomes were measured using a test instrument (see Figure 2).

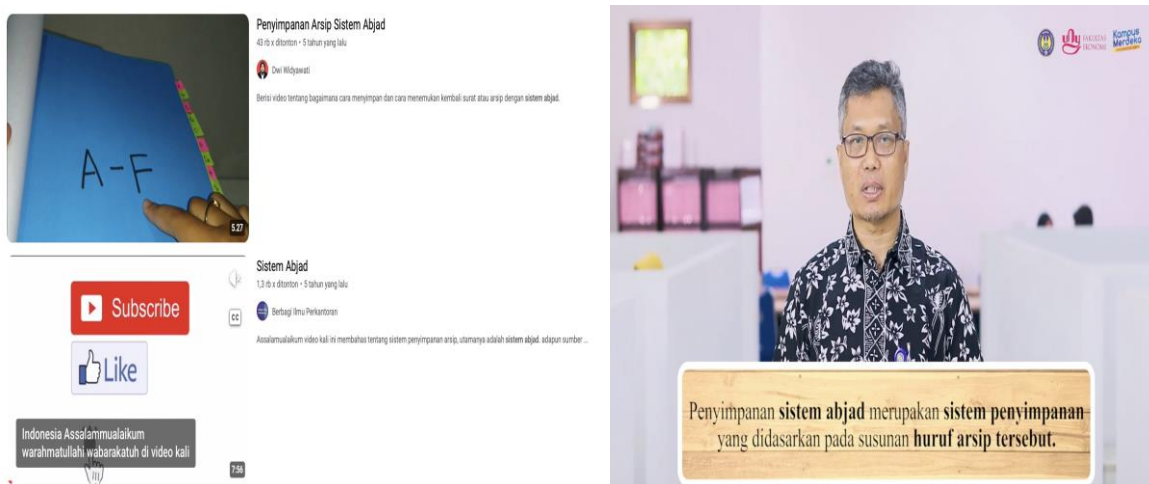


Figure 1. Video Sample

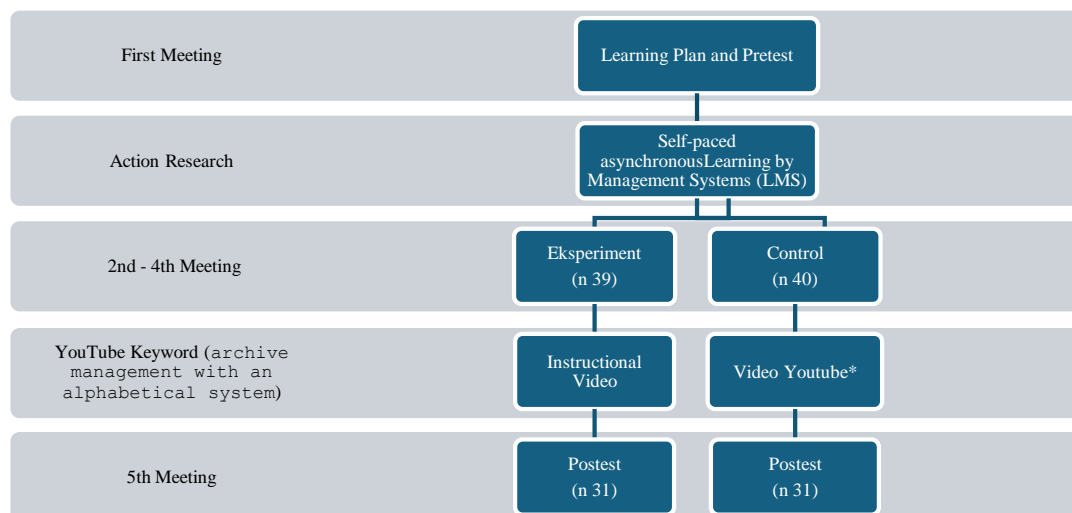


Figure 2. Research Procedure

Based on several considerations, 17 students did not participate in the learning activities, leaving 62 students whose data were included in the final analysis. A study by Besekar et al., (2023) concluded that the sample size for testing any novel approach essentially required a minimum of 24 participants in each group. Data were collected using both test and non-test techniques. The test instrument consisted of multiple-choice questions designed to measure cognitive learning outcomes, comprising 15 items with five answer options each. Meanwhile, skill-based learning outcomes were assessed using a non-test approach through a holistic scoring rubric with four levels: very good, good, poor, and very poor.

The validity of both test and non-test instruments was evaluated through expert judgment involving two experts in archival management and educational assessment. The results indicated that all items were aligned with the intended indicators and were deemed appropriate for use. The test instrument's reliability was confirmed using Cronbach's alpha (0.813), indicating good internal consistency. For the non-test instrument, reliability was ensured through a structured rubric, and the course instructor conducted assessments to maintain scoring consistency.

Data analysis included descriptive statistics, normality testing, and homogeneity testing. The results of the normality test indicated that the data were not normally distributed; therefore, a non-parametric statistical test was applied. Hypothesis testing was conducted using the Mann-Whitney U test to examine differences in learning outcomes between the experimental and control groups. All analyses were performed in RStudio.

RESULTS AND DISCUSSION

Results

This section presents the research findings, including respondent demographics, descriptive statistics, normality and homogeneity tests, and hypothesis testing using the Mann-Whitney U test. The demographic characteristics of the respondents are presented in Table 2.

Table 2. Demographic of the respondent

Information		Control		Experiment	
		n	%	n	%
Gender	Male	24	77.41	25	80.64
	Female	8	22.59	6	19.36
Year of Birth	2004	7	22.58	9	29.03
	2005	24	77.42	22	70.97

Table 2 shows the demographic characteristics of the respondents in the control and experimental groups. In terms of gender, male students constituted the majority in both groups,

accounting for 77.41% in the control group and 80.64% in the experimental group. Regarding year of birth, all respondents were born between 2004 and 2005, indicating that the entire sample belongs to Generation Z. Table 3 presents Informative descriptions of the mean, standard deviation, minimum, maximum, and count of those variables.

Table 3. Statistics Descriptive

	Control		Experiment	
	Knowledge	Skill	Knowledge	Skill
Mean	70.32	58.53	72.58	74.95
SD	17.79	13.83	17.69	12.07
Minimum	30	43.88	40	56.66
Maximum	100	84.44	100	95.27
Count	31	31	31	31

Table 3 shows the differences in knowledge and skill test results between the two groups. The results indicate that the experimental group achieved higher mean scores on both knowledge and skill outcomes than the control group.

In particular, the difference in skill scores between the two groups was relatively substantial, with a mean difference of 16.42. This suggests that the instructional videos may be associated with better student performance in understanding and applying the alphabetical filing system.

To determine whether the differences between the two classes are statistically significant, it is necessary to conduct statistical tests. Therefore, the following section presents the results of the normality and homogeneity tests for both the knowledge and skills variables (Tables 4 and 5).

Table 4. Shapiro-Wilk Test Result

No.	Variable	W Statistic	p-value	Conclusion
1	Knowledge	0.94995	0.01328	The data are not normally distributed.
2	Skills	0.92726	0.00124	The data are not normally distributed.

Table 5. Levene's Test Result

No.	Variable	F Value	p-value	Conclusion
1	Knowledge	0.0478	0.8277	Variances are homogeneous
2	Skills	0.0012	0.9724	Variances are homogeneous

Table 4 presents the results of the Shapiro-Wilk test, indicating that the data for all variables are not normally distributed. Table 5 shows the results of Levene's test, confirming that the data are homogeneous. Based on these findings, a non-parametric test was employed. The Mann-Whitney U test was used to examine whether there were significant differences in learning outcomes (knowledge and skills) between the experimental and control groups. The results of the hypothesis testing are presented in Table 6.

Table 6. Mann-Whitney U Test

No.	Variable	M-W U Test	Wilcoxon W	Z	Sig.	Conclusion
1	Knowledge	446.000	942.000	-0.493	0.622	H0 Accepted
2	Skill	166.000	662.000	-4.434	0.000	H0 Rejected

Table 6 confirms the Mann-Whitney U test results. For the knowledge aspect, the significance value was 0.522 (> 0.05), indicating that there is no statistically significant difference in knowledge learning outcomes between the two groups. In contrast, for the skill aspect, the significance value was 0.000 (< 0.05), indicating a statistically significant difference in skill learning outcomes between the two groups.

Discussion

This discussion section addresses the research questions, the implications of the findings for the adoption of video in learning, and the study's limitations. First, regarding knowledge, the findings indicate that there is no significant difference in knowledge learning outcomes between the control

and experimental groups. This suggests that both types of video are effective at delivering content and supporting students' understanding of the material. Although YouTube videos are not specifically designed or developed based on structured instructional design principles, they still serve as effective learning media. This finding implies that both types of videos can provide sufficient knowledge support and facilitate students' ability to construct understanding from the presented content, which may contribute to knowledge retention in long-term memory.

Several factors may explain this result. Video-based learning, whether through YouTube or instructional videos, allows students to pause, replay, speed up, or focus on specific segments they find difficult (Liao & Wu, 2023). This flexibility enables students to regulate their own learning process. In addition, both types of video are accessible online, allowing students to learn anytime and anywhere, and are generally easy to use (Insorio, 2025; Mohamed & Shoufan, 2022).

These findings are consistent with previous studies. For example, Guaya et al., (2024) reported that the integration of YouTube videos within a Project-Based Learning (PBL) approach can support improved learning performance in chemical engineering education. Furthermore, this result complements earlier findings by Roy (2023), which suggest that YouTube videos can support learning in theory-based administrative subjects at both undergraduate and postgraduate levels.

Second, the findings indicate a statistically significant difference in skill-related learning outcomes between the experimental and control groups. This suggests that instructional videos may be associated with better skill acquisition than YouTube-based videos. One possible explanation is that instructional videos are developed in alignment with learning objectives and follow a structured design process, including needs analysis, design, and development stages guided by CTML principles. In contrast, YouTube videos are generally produced to meet broader content demands and may not be specifically aligned with instructional goals.

The integration of multimedia principles such as segmentation, signalling, and coherence (Mayer, 2014a, 2014b) in instructional videos may support the delivery of procedural information more effectively, particularly in tasks such as learning the alphabetical filing system.

The findings are consistent with previous studies. For instance, reported that video-based learning can support improvements in student performance. These results also suggest that using video facilitates students' learning, potentially contributing to their academic achievement. In addition, the better performance in skill-related learning outcomes observed in the group using instructor-developed videos compared to YouTube-based videos further supports earlier studies indicating that not all YouTube content is suitable for instructional use (Ergul, 2021; Fares et al., 2023; Mohamed & Shoufan, 2022). This is particularly relevant in learning contexts that require the development of practical skills, where instructional alignment and structured design are critical.

Third, the results of this study have significant implications for instructional practice, particularly in subjects with practical components. Educators need to give special attention when implementing independent (asynchronous) learning through LMS or other media. This study is important in the era of digital learning, as the appropriateness of video selection depends on educators. Therefore, educators should provide relevant learning resources for students in digital learning contexts (Yadav, 2023). However, video-based instructional media need not be developed independently. Given the constraints of time, cost, and effort, educators may utilise video creation and editing tools powered by artificial intelligence as an alternative (Fyfield et al., 2022; Xu et al., 2025).

Despite successfully comparing the impact of the two types of video on learning outcomes, this study has several limitations. First, the sample size was relatively small ($n = 62$), which limits the generalizability of the findings. Second, the researcher intervened in the selection of YouTube videos, so students did not freely choose videos based on their own preferences and interests. Finally, this study did not empirically examine the factors influencing learning outcomes, focusing solely on outcomes facilitated by video-based learning. Therefore, it remains unclear whether the observed learning outcomes were directly associated with the use of instructional videos or were influenced by other factors that may have played a more dominant role.

CONCLUSION

This study revealed no significant difference in learning outcomes between students who used instructional videos and those who used YouTube-based videos. In contrast, a statistically significant difference was found in skill-related learning outcomes between the control and experimental groups. These findings suggest that educators should be cautious when selecting YouTube videos, particularly in practice-based learning contexts. While YouTube videos may support cognitive learning, instructional videos appear to be more suitable for facilitating skill development. However, this study is limited by a relatively small sample size, which restricts the generalizability of the findings. Therefore, further research with larger samples and broader contexts is needed to provide more robust evidence for large-scale implementation.

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