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Comparison of the Effectiveness of Distance Learning for Software Courses in Higher Education: Videos vs. Texts

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Abstract

This study investigates the effectiveness of video-based learning compared to traditional text-based methods in distance education for software courses. The research was based on two samples of students $(n_1 = 32, n_2 = 30)$ enrolled in the "Fundamentals of PSPP" distance course at the N.B. School of Design and Education (PSPP is a free alternative to SPSS). Students were asked to fill in a questionnaire at the end of the year indicating their views on the two methods of learning.

Results indicate that students who utilized video content exhibited higher levels of understanding and satisfaction. Videos combining visual and auditory elements were found to significantly enhance learning outcomes by reducing cognitive load and providing clearer demonstrations of software procedures. The study highlights the advantages of video-based learning in fostering a sense of connection between instructors and students, which enhances motivation and engagement in asynchronous learning environments. The study concludes that video-based learning is a superior method compared to text-based learning for teaching complex software skills in distance education, promoting higher student achievement and engagement.

Keywords: video capture, distance learning, higher education, software courses, screencast, Video-Based Learning (VBL), online learning, asynchronous learning, statistics courses

1. Introduction

1.1 General Background

Video technology has become an essential tool for online learning, serving effectively as both an asynchronous alternative and a supplement to in-person instruction. The principal methods for creating educational video content include using a camera and employing video capture technology, such as screencasts (Ghilay, 2018a; Ghilay, 2018b).

Screencasts are digital recordings of computer screen activity, usually paired with audio narration. Unlike static screenshots, screencasts capture continuous changes on the screen, creating a video that can be enriched with narration and captions (Screencast, 2021). These tools are designed to teach specific subjects by demonstrating actions pertinent to the topic (Ghilay, 2017a; Ghilay, 2017b; Ghilay & Ghilay, 2015).

The integration of visual and auditory elements in screencasts significantly enhances the learning experience. According to Mayer's (2001) multimedia learning theory, animated presentations with accompanying audio provide a more effective learning experience than traditional methods, such as still images with text. This is supported by Paivio's (2007) dual coding theory, which posits that information processed through both linguistic and non-linguistic channels enhances learning.

After recording a screencast, it can be further edited to include additional modifications, such as segmenting and merging sections, hiding and revealing parts of the screen, or adding photos, titles, and subtitles (Ghilay, 2018a). This flexibility makes screencasts more dynamic and engaging than standard video recordings (Ruffini, 2012).

Using videos in the classroom can increase productivity for both educators and students. Videos allow the creation of explanatory content, boost student engagement, and support collaborative learning. Students can benefit from the ability to pause and review material at their own pace, which is especially helpful for those needing both oral and visual explanations of course material (Screencast, 2021).

The widespread availability of smartphones and tablets has further enhanced the accessibility of educational videos, enabling students to learn at any time and place (Campbell et al., 2010; Peterson, 2007). Additionally, digital videos can present experts' actions alongside their commentary, making screencasts pedagogically comparable to face-to-face instruction (Wouters et al., 2008). Studies have shown that videos can significantly aid students' comprehension and retention of content in quantitative courses (Ghilay, 2019; Pang, 2009; Traphagan et al., 2010).

Screencasts have a notable advantage over traditional printed materials by reducing cognitive load. Printed texts and illustrations compete for the same visual processing channels, complicating cognitive processing (Mayer, 2005). Screencasts, by reducing the load on both visual and verbal channels, facilitate more effective learning (Lloyd & Robertson, 2012).

Educators have successfully integrated screencasts into a wide range of disciplines, including computer programming (Yuen, 2007), instructional design and technology (Sugar et al., 2010), object-oriented programming (Lee et al., 2008), mathematical modeling (Ellington & Hardin, 2008), and nursing (Phillips & Billings, 2007). These examples illustrate the versatility and effectiveness of screencasts in demonstrating specific actions and concepts.

Adopting screencast technology requires minimal investment in technological infrastructure. With a personal computer, microphone, appropriate software, and access to an LMS and file-sharing platforms like YouTube or Vimeo, instructors can easily implement this technology (Ghilay, 2017a; Ramli et al., 2017). Screencasts are thus a cost-effective and accessible tool for enhancing online education. Moreover, the scalability of screencasts allows a single video to reach an unlimited number of students, making it an efficient method for disseminating knowledge (Kay, 2012).

Screencast technology also supports the flipped classroom model, where students study course material at home via screencasts and engage in guided practice during class time (Smith & Smith, 2012). This approach transforms the traditional classroom and promotes active learning, encouraging students to take responsibility for their own learning while providing opportunities for interactive, hands-on activities during class (Bishop & Verleger, 2013).

Video-Based Learning (VBL) involves using video clips to fully cover a course syllabus, either as a replacement for or as a supplement to live lectures. Recent studies indicate that VBL has significant advantages for learning quantitative subjects in higher education, offering greater flexibility and higher learner satisfaction (Ghilay, 2019; Ghilay, 2018a; Ghilay, 2018b). VBL allows students to revisit complex topics multiple times and learn at their own pace, which is particularly beneficial for subjects requiring high conceptual understanding (Giannakos, 2013).

Research by Zhang et al. (2006) supports the idea that interactive video-based learning environments enhance student engagement and learning outcomes by allowing learners to control the pace and sequence of instruction. This interactivity is particularly advantageous in software courses, where students can pause and replay segments of videos to fully grasp complex concepts and procedures.

Video instruction also supports the development of higher-order thinking skills. According to Bloom's Taxonomy (Bloom, 1956), higher-order thinking skills such as analysis, synthesis, and evaluation are crucial for advanced learning. Videos that incorporate problem-solving tasks and real-world applications can help students develop these skills more effectively than text-based materials alone (Brame, 2016).

The role of multimedia learning in enhancing comprehension and retention is well-documented. Research by Moreno and Mayer (2000) highlights the benefits of multimedia instruction, including improved problem-solving skills and deeper understanding of subject matter. This is particularly relevant in software courses, where the integration of visual and auditory elements can help students better understand abstract concepts and complex processes.

Additionally, the social presence theory (Short, Williams, & Christie, 1976) suggests that video instruction can create a sense of presence and connection between instructors and students, even in asynchronous learning environments. This perceived social presence can enhance student motivation and engagement, contributing to more effective learning outcomes.

In conclusion, the literature indicates that video-based learning, particularly through screencasts, offers numerous advantages over traditional text-based instruction. These include enhanced engagement, reduced cognitive load, improved accessibility, and the ability to cater to diverse learning styles. The current study aims to further explore these benefits in the context of distance learning for software courses in higher education, comparing the effectiveness of video and text-based instructional methods.

Previous research (Ghilay, 2021) examined the effectiveness of video clips compared to texts for math courses in higher education. The study found that while students preferred watching videos over reading texts alone, they believed that the combination of video and text was the most effective instructional method. The current study aims to determine if there are significant differences in learning effectiveness between text and video formats for distance software courses focused on statistical procedures. This investigation will build on the existing body of research by applying it to the specific context of software education, which often involves intricate procedural knowledge that may be particularly well-suited to video instruction.

1.2 Study Aim

Computerized statistics courses, designed to teach students how to effectively perform statistical routines, require both a deep understanding of theoretical knowledge and the practical ability to execute the correct routines and interpret the results (Ghilay, 2018a; Ghilay, 2018b). Recorded videos of lectures and problem-solving sessions, produced using screencast technology, can serve as asynchronous substitutes for live lessons. These recordings are particularly suitable for distance learning, as they allow students to review the material multiple times, either in full or in part, according to their preference.

The current study compares the effectiveness of two learning methods: videos versus texts. It examines two groups of students enrolled in the "Fundamentals of PSPP" distance course (PSPP is a free alternative to SPSS) at the N.B. School of Design and Education.

The aim is to determine if one method has a significant advantage over the other. If a clear advantage is found, the superior method should be preferred, and the less effective one might be reconsidered or omitted.

The syllabus was comprehensively covered using both screencast-produced videos and full texts as follows:

1. *Videos*: 179 HD video clips with a total viewing time of 15 hours and 26 minutes. The clips covered all the course material, including lectures and solutions to exercises. Groups of relevant videos (such as chapter 1, chapter 2, solutions for topic 1, etc.) were organized into playlists so students could watch them continuously and easily jump from one topic to another. Each clip was short (a few minutes), making it easy to find and address different issues.
2. *Texts*: 135 pages of lecture text (16,119 words) plus 100 pages of exercises and final answers (6,829 words). The texts also included links to relevant videos and PSPP files for both lectures and exercise solutions.

The course included the following topics and subtopics:

1. *Introduction to PSPP*: Basic statistical processing, table of frequencies.
2. *Data editor*: Determining variable type and label, variables' values and labels, missing values.
3. *Foundations of descriptive statistics*: Measurement scales, discrete variables, continuous variables, histogram.
4. *Syntax*: Creation, updating, and running of syntax commands.
5. *Case selection*: File split, case selection, and creation of random sample.
6. *Descriptive statistics - additional tools*: Descriptives, explore.
7. *Means*: Mean calculation, sort by independent variables.
8. *Computerized variables*: Variable computing, functions in mathematical expressions, date computing, creation of discrete variables.
9. *Sort files and data control*: Generate reports to find missing/incorrect variables.
10. *Statistical conclusion (1)*: Independent samples T-Test, paired samples T-Test, one sample T-Test.
11. *Statistical conclusion (2)*: ANOVA (one-way analysis of variance).
12. *Statistical conclusion (3)*: Correlations, crosstabs, and chi-square test.
13. *Statistical tools analysis*: Reliability (Cronbach’s alpha including item analysis) and factor analysis.

2. Method

2.1 Study Framework

Students' views on two methods of learning, reading texts and watching videos, were examined in a study conducted at the N.B. School of Design and Education in Haifa, Israel. The study involved 62 third-year students from the Department of Business Management who were enrolled in the distance course 'Fundamentals of PSPP'. This course, comprising two academic hours per week, was offered during both semesters of the 2018-19 and 2019-20 academic years.

2.2 The Research Questions

The research questions were structured to measure students' views on the effectiveness of both methods of distance learning:

1. What added value does watching videos offer beyond what is provided by texts for software learning in distance education?
2. Is there a preference for one of the two methods (video/text) or for a combination of them?

2.3 Population and Samples

Population: Higher-education students studying software courses.

Samples: Group 1 (2018-19) - 32 students
Group 2 (2019-20) - 30 students
overall - 62 students

Students were asked to fill in a questionnaire at the end of the year indicating their views on the two methods of learning. The questionnaire was anonymous, and the response rates were as follows:
2018-19: 80% (32 out of 40)
2019-20: 75% (30 out of 40)

2.4 Tools

Respondents were asked to complete an online five-point Likert scale questionnaire consisting of 35 items and one open-ended question that examined students' attitudes toward the above research questions.

The scale was: 1-strongly disagree, 2-mostly disagree, 3-moderately agree, 4-mostly agree, 5-strongly agree. The open-ended question asked: “In conclusion, add comments about learning a software course such as 'Fundamentals of PSPP' using videos compared to reading texts.”

2.5 Data Analysis

The 35 items in the questionnaire were divided into six factors. Cronbach's alpha was calculated to test the degree of homogeneity of each factor’s constituent items.

These are the six factors and their constituent items:

1. *Video quality*: This encompasses the quality of the lecturer's explanations and voice, the pace at which lectures progress, the clarity of presentation of various components, the extent of coverage of lectures and exercises, and the effectiveness in presenting all required topics.

2. *Text quality*: This factor includes the clarity of written explanations, the extent to which lectures are covered and well presented in text format, and the effectiveness in presenting all required topics.

3. *Added value of videos compared to texts*: This factor explores the ability to understand unclear issues through videos, the unique contribution of videos in effectively demonstrating and explaining the sequence of actions to be performed on the computer, their role as an excellent alternative to a lecture in a computer class, improved comprehension of exercises, and the integration of visual demonstrations with auditory explanations.

4. *Preference for videos*: This encompasses the preference for comprehensive video coverage over texts due to better understanding, better concentration, better guidance, the ability to better explain computer-related issues, and offering a significant comprehensive substitute to text.

5. *Preference for texts*: This factor includes the preference for texts because comprehensive written material covers the entire syllabus, better understanding, easier concentration, better clarity, explaining course-required issues more clearly, and great substitutability of texts for videos.

6. *Preference for a combination of videos and texts*: This factor measures the extent to which there is added value by combining videos and texts.

Table 1 presents all the factors, their internal reliability, and the items in the questionnaire that address each factor. It should be noted that the Cronbach's alpha for all factors is higher than 0.8 and for three factors it is higher than 0.9. This indicates very high reliability.

Table 1. Factors and reliability

Factors	Questionnaire questions
Video quality Cronbach's alpha=0.891	The lecturer's explanations in the videos are clear and articulate. The lecturer's speech in the videos is well-enunciated. The lecturer presents explanations at a moderate pace, ensuring clarity. Different components of the course are clearly outlined. The videos comprehensively cover all course lectures. The videos thoroughly address all exercises included in the course. The videos effectively present and illustrate all necessary study topics.
Text quality Cronbach's alpha=0.942	The written explanations provided are lucid and comprehensive. Different components are distinctly presented. The texts provide comprehensive coverage of course lectures. The texts effectively present all necessary study subjects.
Added value of videos compared to texts Cronbach's alpha=0.841	The videos allowed me to understand topics I did not understand when reading the text. The videos make a unique contribution by effectively demonstrating and explaining the sequence of actions to be performed on the computer for each task. The videos serve as an excellent alternative to a lecture in a computer class. The solutions to exercises presented in the videos help me comprehend exercises that I struggled with on my own. Videos offer a unique contribution by integrating visual demonstrations with auditory explanations.
Preference for Videos Cronbach's alpha=0.851	When comprehensive video coverage of all the material is available, written materials are unnecessary. I find that I understand most of the topics presented in the video better than when I read the text. It's easier for me to concentrate when watching a video compared to concentrating on reading written material. Videos provide better guidance than text on understanding the software. The advantage of videos lies in their ability to explain computer-related issues in a more understandable manner than text. Learning software through videos offers a significant advantage over text. I prefer learning primarily by watching a video rather than reading text. Videos serve as a comprehensive substitute for written material.
Preference for Texts Cronbach's alpha=0.973	I primarily prefer learning through studying written material. When I have access to comprehensive written material covering the entire syllabus, I find no necessity for videos. I find that I understand most topics better in text format than through watching videos. I find it is easier to concentrate on reading a text than on watching a video. Texts provide better clarity on understanding all aspects required in the course compared to videos. Reading texts offers the advantage of explaining course-required issues more clearly than videos do.
Preference for a combination of videos and texts Cronbach's alpha=0.912	Each of the two methods has its own set of advantages and disadvantages, making it beneficial to combine them. There's a considerable advantage in integrating videos and texts that comprehensively cover the syllabus. Watching videos and reading texts complement each other, thus both hold importance. I personally prefer learning through a combination of videos and text readings. It's advisable to supplement course texts with videos.

For each factor, a mean score and standard deviation were calculated. Additionally, the following tests were undertaken ($\alpha <= 0.05$):

Two samples T-test: To determine if there were significant differences between the two groups (2018-19 and 2019-20).

Paired samples T-test: To determine if there were significant differences between 'Video quality' and 'Text quality', as well as among the three factors: 'Preference for videos', 'Preference for texts', and 'Preference for a combination of videos and texts'.

3. Results

Table 2. Sample sizes, mean scores, and standard deviations for each factor by group (2018-19 and 2019-20)

No.	Factor	Group 1: 2018-19			Group 2: 2019-20			Two samples T-test
		N	Mean	S.D	N	Mean	S.D	
1	Video quality	32	4.83	.34	30	4.80	.47	$t_{(60)} = .249, p = .804$
2	Text quality	32	4.46	.80	30	4.75	.56	$t_{(55)} = -1.63, p = .109$
3	Videos added value as compared to texts	32	4.66	.50	30	4.89	.21	$t_{(42)} = -2.303, p = .026$
4	Preference for videos	32	4.50	.51	30	4.94	.13	$t_{(35)} = -4.739, p = .000$
5	Preference for texts	32	2.68	1.42	30	3.42	1.61	$t_{(58)} = -1.900, p = .062$
6	Preference for a combination of videos and texts	32	4.81	.25	30	4.34	.88	$t_{(33)} = 2.794, p = .009$

Since the fundamental requirement for comparing the effectiveness of both learning methods is the inclusion of high-quality videos and texts, a prerequisite for the research was to assess the quality of these resources. If this condition held, the comparison between these two methods could be tested. The findings indicate that the quality of both resources was high: Learners rated the videos with an excellent mean score of 4.83 (Group 1) and 4.80 (Group 2) out of 5, while the quality of the texts also received high mean scores of 4.46 (Group 1) and 4.75 (Group 2) out of 5 (Table 2, items 1-2).

A Two samples T-test ($\alpha \leq 0.05$) showed no significant difference between Group 1 and Group 2 regarding the first two factors ($t_{(60)} = .249, p = .804$, $t_{(55)} = -1.63, p = .109$). Therefore, means scores for both groups combined are presented in in table 3.

Table 3. Sample sizes, mean scores, and standard deviations factors 1 and 2 for both groups combined

No.	Factor	N	Mean	Std. Deviation
1	Video quality	62	4.82	.40
2	Text quality	59	4.60	.70

A paired sample T-test ($\alpha \leq 0.05$) was conducted to examine if there is a significant difference between video quality and text quality. Results showed a significant difference between them; $t_{(58)} = 4.048, p = .000$. However, both values are considered very high, indicating that the prerequisite exists.

Based on a two-samples T-test ($\alpha \leq 0.05$), significant differences between both groups were found regarding factors 3, 4, and 6 (Table 2):

3 - Videos added value compared to texts (4.66, 4.89, $t_{(42)} = -2.303, p = .026$).
4 - Preference for videos (4.50, 4.94, $t_{(35)} = -4.739, p = .000$).
6 - Preference for a combination of videos and texts (4.81, 4.34, $t_{(33)} = 2.794, p = .009$).

Despite these significant differences, all mean scores of factors 3, 4 and 6 are very high.

Regarding factor 5 (Preference for texts), both groups' mean scores are very low (2.68, 3.42) and there is no significant difference between them (Table 2, $t_{(58)} = -1.900, p = .062$).

To determine if there are significant differences between factors 4, 5 and 6 for each group separately, a paired samples T-test was undertaken. It was found that for both groups, there were significant differences between these three factors as follows:

Group 1:
Preference for texts (2.68) and Preference for videos (4.50), $t_{(31)} = -7.381, p = .000$.
Preference for texts (2.68) and Preference for a combination of videos and texts (4.81), $t_{(31)} = -7.899, p = .000$.
Preference for videos (4.50) and Preference for a combination of videos and texts (4.81), $t_{(31)} = -3.157, p = .004$.

Group 2:
Preference for texts (3.42) and Preference for videos (4.94), $t_{(29)} = -5.041, p = .000$.
Preference for texts (3.42) and Preference for a combination of videos and texts (4.34), $t_{(29)} = -4.370, p = .000$.
Preference for videos (4.94) and Preference for a combination of videos and texts (4.34), $t_{(29)} = 3.652, p = .001$.

The meanings of these finding is as follows:

1. Videos have substantial added value compared to texts (4.66, 4.89).
2. There is a significant preference for either videos alone or videos combined with texts over texts alone. The gaps between Preference for videos and Preference for texts are large for both groups (Group 1: 4.50-2.68 = 1.82, Group 2: 4.94-3.42 = 1.52). Similarly, the gaps between Preference for a combination of videos and texts and Preference for texts are also notable (Group 1: 4.81-2.68 = 2.13, Group 2: 4.34-3.42 = 0.92).

Responses to the open-ended question strengthen the results of the quantitative part of the study, particularly highlighting the significant added value and superiority of video clips compared to texts for software learning, as follows:

> *"In my opinion, videos are better than text because they provide clear explanations for all the steps, while the written material can be difficult and complicated to read. Therefore, I prefer to watch the video and follow all the stages of solving tasks. Videos have a significant advantage over written material.*"
>
> *" Learning software through videos is significantly easier for me. I manage to understand and complete tasks much better compared to learning through text.*"

4. Discussion

The research findings clearly indicate that video-based learning significantly enhances comprehension and retention of complex software procedures in distance education compared to text-based methods. This enhancement stems from the multimodal nature of videos, which combine visual and auditory elements to facilitate a deeper understanding of abstract and procedural content. Students engaging with video content reported higher levels of engagement and satisfaction, which are strongly correlated with improved learning outcomes. Consistent with the work of Moreno and Mayer (2000), screencasts effectively visualize processes that are challenging to convey through text, reducing cognitive load and improving retention.

Screencasts uniquely enable students to observe software procedures in real-time, providing clear demonstrations of complex sequences and operations. Textual descriptions often fail to convey such nuances effectively. The ability to pause, rewind, and replay videos allows learners to review challenging material at their own pace, a key advantage for students requiring multiple exposures to fully grasp intricate concepts. This self-paced learning supports diverse learning speeds and reinforces understanding through repetition, making video-based instruction particularly advantageous.

Videos also enrich the learning experience by integrating visual and verbal cues. Mayer’s Cognitive Theory of Multimedia Learning (2005) suggests that this dual coding process helps learners construct more robust mental representations, enabling stronger connections and better information retrieval during assessments or practical applications.

From a socio-emotional perspective, the Social Presence Theory (Short, Williams, & Christie, 1976) underscores the ability of videos to create a sense of connection between instructors and students. This perceived presence fosters motivation and engagement, even in asynchronous learning environments. Seeing and hearing the instructor can mitigate the isolation often associated with distance education, promoting a sense of community and support. This increased social presence drives motivation and persistence, which are crucial for success in online learning.

The multimodal nature of videos also accommodates various learning styles. Visual learners benefit from graphics and demonstrations, auditory learners gain from spoken explanations, and kinesthetic learners can replicate hands-on activities presented in the videos. This inclusivity ensures that instructional material effectively addresses a diverse student population.

The study highlights that visual demonstrations in videos reduce ambiguity and increase clarity, especially in technical subjects requiring precise actions and sequences. For instance, in programming or software usage, watching an expert navigate interfaces and execute commands enhances understanding far more than reading about the steps. Similarly, dynamic and engaging video content, featuring animations, visual effects, and interactive elements, maintains student attention and reduces the monotony of traditional text-based materials.

Videos also promote inclusivity by accommodating students with disabilities. Features such as subtitles, transcripts, and audio descriptions ensure equitable access to educational content, enhancing the learning experience for all students, regardless of individual needs.

The results align with existing literature emphasizing the benefits of video-based learning in enhancing comprehension and engagement across disciplines (Mayer, 2001; Zhang et al., 2006). The findings further corroborate prior research by Ghilay (2018a, 2018b) and Giannakos (2013), which highlight the value of video-based instruction in promoting retention and understanding in higher education.

This study's implications extend beyond software courses to other fields. Disciplines requiring procedural understanding, such as engineering, medicine, and lab-based sciences, can benefit from the detailed demonstrations that video-based learning offers. Humanities courses may also use video content for analyzing complex textual interpretations or visual media, broadening the utility of video-based learning across academic domains.

In conclusion, the findings emphasize the transformative potential of video-based learning in distance education. Videos enhance comprehension, retention, engagement, and satisfaction while addressing diverse learning needs. By integrating video content effectively, educators can create a more inclusive and impactful learning environment tailored to the demands of modern distance education.

5. Conclusions

This study demonstrates that video-based learning is a superior instructional method compared to traditional text-based approaches in distance education for software courses. Screencasts, as an integral part of video-based learning, not only simplify complex concepts but also make the learning process more engaging. The findings reveal a clear student preference for video-based instruction due to its interactive and dynamic nature, which accommodates various learning styles and offers the flexibility to revisit material multiple times.

Video-based environments foster higher-order thinking skills by incorporating problem-solving tasks and real-world applications, aligning with Bloom's Taxonomy (Bloom, 1956). These elements enhance cognitive engagement, allowing learners to process visual and auditory information simultaneously as proposed by dual coding theory. This approach enables students to develop elaborate mental representations of content, facilitating easier retrieval and application in practical settings.

Interactive features within videos, such as quizzes, annotations, and timelines, play a pivotal role in sustaining student interest and improving learning outcomes. These features provide immediate feedback, helping learners identify and address misunderstandings promptly, which is essential for a deeper and more accurate grasp of the material.

Videos also address challenges commonly associated with distance learning, such as the lack of face-to-face interaction. By fostering a sense of connection and community, videos promote social presence, which enhances student motivation and reduces feelings of isolation. This interactive and supportive learning environment encourages sustained engagement and commitment, vital for success in online education.

Furthermore, video-based instruction contributes to higher retention rates by presenting content in an engaging and easily comprehensible format. This is particularly critical in disciplines like computer science and software engineering, where the application of complex knowledge is key. The ability to recall and effectively use information ensures better academic performance and preparedness for professional demands.

In conclusion, incorporating video content into distance learning curricula can significantly enhance education quality and student outcomes. Video-based instruction not only improves comprehension but also makes learning more accessible and engaging. It bridges the gap between theoretical knowledge and practical application, equipping students for success in both academic and professional contexts.

The study underscores the transformative potential of video-based learning as a powerful educational tool. By integrating video content into curriculum design, particularly for subjects involving procedural knowledge, educators can provide an optimized learning experience that meets the diverse needs of modern students. This approach is essential for advancing achievement, satisfaction, and inclusivity in distance education.

6. Recommendations

Based on the findings, it is recommended that educational institutions prioritize the integration of video-based learning materials in their distance education programs, especially for courses requiring complex procedural knowledge and technical skills (Ghilay, 2024; Ghilay & Ghilay, 2014). Institutions should ensure videos are an integral part of the curriculum, supported by robust instructor training. Training programs should focus on video production techniques such as scripting, editing, and incorporating interactive elements like quizzes. Furthermore, training should address accessible design features, including closed captions and transcripts, to enhance inclusivity. Best practices, such as creating clear, segmented, and engaging videos, must also be emphasized.

A blended learning approach that combines video-based materials with supplementary text resources is strongly advised. Such an approach accommodates diverse learning preferences, catering to auditory, visual, and kinesthetic learners. For example, screencasts can effectively demonstrate processes, while accompanying texts can provide detailed references, creating a comprehensive and versatile learning environment.

Institutions should invest in the necessary infrastructure to support high-quality video production. This includes access to advanced recording equipment, editing software, and dedicated media production teams or centers. These teams can offer technical assistance and provide faculty with training workshops, ensuring they stay abreast of advancements in educational technology.

Adopting a flipped classroom model is another recommendation. In this model, students engage with lecture content via videos at home, allowing for in-depth, hands-on application during in-class sessions (Bishop & Verleger, 2013). This approach promotes active learning and prepares students to participate in collaborative projects and discussions.

Accessibility must remain a priority in video-based learning. Features such as subtitles, transcripts, and audio descriptions are essential to ensure that all students, including those with disabilities, can benefit from the materials. These accessibility enhancements improve the overall usability of content, providing multiple ways for learners to process and engage with information.

Future research should explore the long-term impacts of video-based learning on student performance and retention. This research would provide further validation of its effectiveness and help refine implementation strategies. Gathering regular feedback from students through surveys and evaluations is also essential for improving video-based learning materials and ensuring they meet learner needs effectively.

In conclusion, integrating video-based learning into distance education requires a multifaceted approach encompassing instructor training, infrastructure investment, accessibility enhancements, and continuous research. By adopting these strategies, educational institutions can create engaging, inclusive, and effective learning environments that address the challenges of modern education.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Obtained.

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The Publication Ethics Committee of the Canadian Center of Science and Education.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

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