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AI-GENERATED VERSUS HUMAN-RECORDED LECTURE VIDEOS: A COMPARATIVE ANALYSIS OF LEARNING OUTCOMES

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Synopsis:

Using a randomized experimental design, 74 undergraduate students watched instructional videos of identical content presented by either an AI avatar or a live-recorded human. Comprehension assessments and design quality surveys were used to analyze differences in student achievement and perceptions. Results suggest AI-generated videos may offer an efficient alternative to traditional studio production.

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Abstract: This intervention-based study investigated differences in learning outcomes and student perceptions when using lecture videos in a collegiate setting. Seventy-four students were randomly assigned to watch a 17-minute instructional video featuring either a human instructor or an AI avatar designed to replicate the human in both appearance and voice. Both videos used identical scripts, visuals, and editing, and were viewed individually in a standardized computer lab setting. Analysis of the assessment data revealed no statistically significant differences in knowledge gains between the two groups. Survey responses indicated that the majority of students who viewed the AI-generated video did not recognize the avatar's artificial origin. Despite this, participants from both groups expressed a clear preference for human-led instruction, often citing factors like engagement and trust. These findings provide modest but valuable insights into the evolving discourse around the instructional efficacy of AI-generated lecture content.

Introduction

Lecture videos—multimedia resources featuring instructors delivering factual, conceptual, or procedural content—are now a staple in digital learning environments (Winslett, 2014). Extensive prior research has confirmed their educational effectiveness in both live and asynchronous learning formats (Scagnoli et al., 2019), citing benefits such as improved academic performance (Kay, 2012; Giannakos, 2013; Nouri, 2016), greater learner engagement (Zhang et al., 2006; Guo, Kim, & Rubin, 2014; Abeysekera & Dawson, 2015; Cowit & Barker, 2022), and enhanced satisfaction (Chester et al., 2011). However, these outcomes are often dependent on key production elements like video duration (Slemmons et al., 2018), audio-visual quality (Gysbers et al., 2011), bandwidth reliability (Hsin & Cigas, 2013), on-screen instructor presence (Stodberg, 2012), interactive features (Zhang et al., 2006), accessibility (Gkatzidou & Pearson, 2009), and visual signaling (Xie et al., 2017).

Though the creation of high-quality lecture videos can be resource-intensive, recent advancements in artificial intelligence have streamlined much of this process (Chan et al., 2024). Educators now utilize AI tools including large language models for drafting scripts, image generation software for visuals, and synthetic avatars for delivering content (Huang et al., 2023). While early research has yielded mixed perspectives on AI's instructional value, recent evidence points to student receptivity, particularly when AI content complements human-facilitated instruction (Vallis et al., 2023). Moreover, Pellis (2023) highlighted various external influences shaping student opinions about AI-delivered materials. Although AI is yet to replicate the emotional depth and connection typical of human educators (Arkün-Kocadere & Çağlar-Özhan, 2024), the researchers for this study hypothesized that contemporary generative technologies could produce an avatar indistinguishable from the original human instructor. To test this hypothesis, an experimental study was designed to explore the following question: How do AI-generated lecture videos impact student learning outcomes and perceptions compared to human-recorded equivalents?

Methods

Seventy-four students enrolled in an introductory educational technology course at a medium-sized U.S. university participated in the study. Each participant was randomly placed into one of two groups to view an instructional video titled *How to design accessible eLearning content*. Each participant watched the video individually on a standardized desktop computer in a large campus lab environment. The control group watched a human instructor recorded in a professional studio, while the experimental group viewed an AI-generated version of the same

instructor, developed using HeyGen. Both versions were precisely 17 minutes in length and featured identical narration, slide visuals, and editing formats, as depicted in Figure 1.

Figure 1. *AI-generated experimental (left) and human-recorded control (right) videos*

Assessment

A mixed-methods, convergent design was implemented to gather both quantitative and qualitative data simultaneously (Cresswell & Plano Clark, 2018). The quantitative instrument included a 10-question multiple-choice quiz that achieved a reliability score of 0.70 based on Cronbach's alpha, indicating acceptable internal consistency. Qualitatively, a 12-item survey that included 11 Likert-style statements and one open-response prompt was used to collect student perceptions of video design and quality. Both instruments were validated through expert panel review to ensure content appropriateness.

Results

Paired-sample t-tests showed that students in both groups experienced statistically significant knowledge improvements from pre- to post-assessment (M = 54.7, SD = 17.2), confirming the effectiveness of both instructional formats. Table 1 presents the group-specific and overall learning gains:

Table 1. *Pre/Post Knowledge Gains*

	Pre-M (SD)	**Post-M (SD)**	**Gains-M**	**p**
Experimental (n=34)	53.1 (15.6)	78.8 (18.1)	15.7	<.001
Control (n=40)	56.2 (18.2)	79.9 (18.6)	13.8	<.001
Full Sample (n=74)	54.7 (17.2)	79.5 (18.4)	14.8	<.001

An independent samples t-test comparing post-test outcomes between the two groups yielded a p-value of .78 and a Cohen's d of -0.064, suggesting no statistically significant variance in achievement levels (see Table 2).

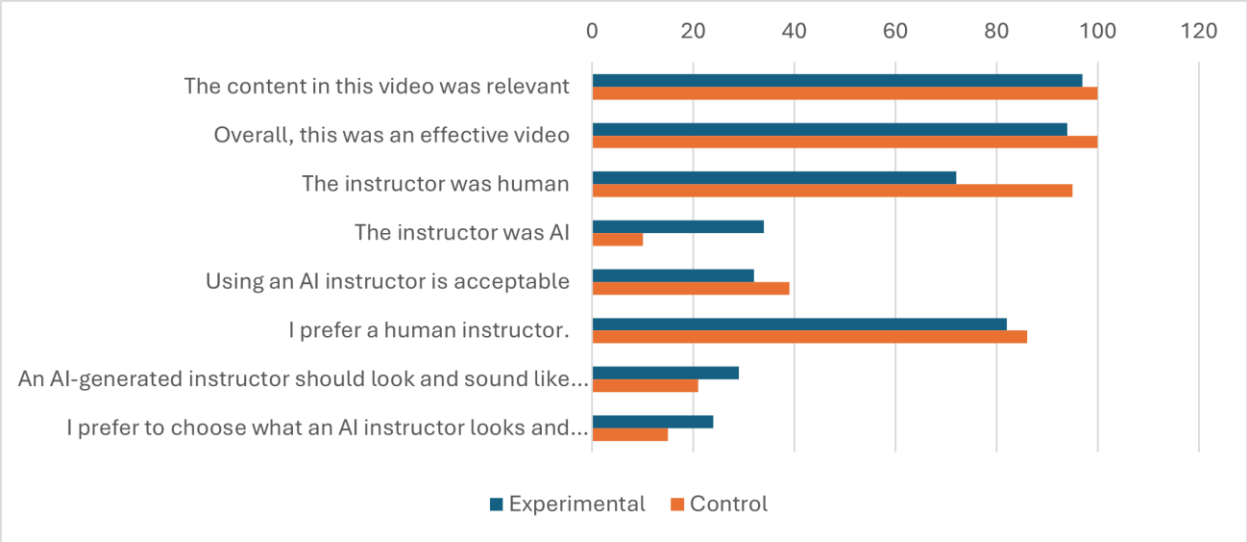
Table 2. *Post Mean Scores Between Groups*

	Post-M	**SD**	**t**	**p**	**Cohen's d**
Experimental (n=34)	78.8	18.1	-0.28	.78	-0.064
Control (n=40)	79.9	18.6			

Survey Findings

The post-session survey received full participation. The majority of respondents from both groups described the videos as "relevant" (99%) and "effective" (97%). Remarkably, 72% of students in the experimental group did not recognize that their instructor was artificially generated. However, 84% of all participants stated a preference for human-delivered instruction. There was minimal reported interest in customizing the avatar's visual or vocal attributes (Figure 2).

Fig. 2. *Percentage of agreement with Survey Items*



Open Response Item Findings

Sixty-eight students (92%) provided written comments in response to the open-ended survey item. Many students in the experimental condition reported surprise upon learning the instructor was AI-generated:

> "I didn't even realize it was an AI-generated instructor until taking this post test. I do not mind it at all it seemed just like I was watching a video another professor had recorded on the topic."

Across both experimental and control groups, three recurring themes emerged:

1) *Preference for human instructors*, for example:

"I feel like it's kind of weird and dystopian. I'd prefer a real person talking but I know AI is easier to create and still teaches you what you need to learn."

2) *Skepticism regarding AI's intentionality*, for example:

"When it comes to learning, I would like to learn from a person because I feel like they are more trusted."

3) *Lower perceived engagement from AI avatars*, for example:

"I think they sound robotic which makes the video less engaging."

Discussion

This study found that both AI-generated and human-recorded instructional videos produced comparable learning gains. These findings support earlier research on "synthetic" instructors (Leiker et al., 2023), yet diverge from meta-

analyses favoring AI-based pedagogical tools in certain settings (Castro-Alonso et al., 2021; Dai et al., 2024). The similar posttest means between groups combined with the reported indistinguishability of the AI avatar in the experimental group suggests strong evidence of the avatar's realism. However, despite that realism, students in both groups indicated strong preference for human video instructors, which may suggest that acceptance of AI avatars as instructional alternatives remains challenged by pre-existing student perceptions related to cognitive engagement and trust.

Limitations

Although this study employed a controlled experimental design, its generalizability is limited by the sample size, specificity of subject matter, and lack of covariate analyses. Future investigations should include an examination of learner dispositions, especially those related to perceptions of AI technology, and consider how such factors interact with instructional delivery.

Conclusion

Given the cost and time savings of AI-based video production, the lack of a significant performance difference between the two instructional formats in this study is noteworthy. This "doppelganger" model offers a novel scientific framework for comparing instructional modalities and provides compelling data to support further investigation of generative AI in the design of educational video content.

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