Effectiveness of AI-Narrated Presentations

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This study explores the effectiveness of AI-narrated voice-over presentations in online education. We compared traditional human-narrated and AI-narrated presentations by analyzing the exam scores of students preparing for the FAA's Part 107 knowledge test in an online course. Our results showed no significant difference in test scores between the two groups. This indicates that AI-narrated presentations can be just as effective as human-narrated ones. The findings suggest that educators can use AI-narrated voice-overs to save time and maintain consistent quality in online courses. This approach can streamline content creation, allowing educators to focus more on interactive and personalized teaching methods. By adopting AI technology, educational institutions can enhance their online courses, improving flexibility and efficiency without compromising learning outcomes. This study provides valuable insights into the potential of AI in online education, highlighting its benefits for both students and educators.

Key words: AI-narrated Voice-Over, Artificial Intelligence, Online Education, FAA Part 107, Student Performance, Educational Technology

Introduction

Artificial intelligence (AI) has emerged as a transformative tool in various domains, including education. The integration of AI into online learning platforms has gained significant traction, offering opportunities for enhanced teaching methods and personalized learning experiences. One area where AI has the potential to improve online education is through the generation of high-quality voice-over presentations from unscripted recordings of instructors' lectures.

Traditional online courses often rely on recordings of human-narrated lectures. Unless the instructor reads off a script in a recording studio, the audio quality can be relatively poor and filled with grammatical and syntax errors associated with normal speech. This includes sentences punctuated with filler word(s) such as "um," "you know," and "like" and the rambling of similar statements over and over again. These "errors" are part of normal conversation and thus work well in a traditional classroom setting. However, they do not produce concise and efficient word use with high audio quality associated with professionally recorded narration. AI-narrated voice-over presentations offer a promising alternative that could streamline the content creation process while maintaining educational quality. However, the effectiveness of these AI-narrated lectures in comparison to human-narrated lectures remains an area that needs further investigation. The drone course was selected for this study due to its requirement of standardized knowledge testing, making it an ideal case to evaluate the impact of instructional delivery methods.

This research aims to assess the effectiveness of AI-narrated voice-over presentations in delivering standardized and high-quality educational content. To this end, an experiment was created between two groups of students at a land grant institution preparing to take the Federal Aviation Administration's (FAA's) Part 107 knowledge test as part of a 3-credit small Unmanned Aircraft Systems (sUASs) course. The knowledge test is a standardized multiple-choice exam required to earn a remote pilot certificate from the FAA. The study seeks to address the following research question:

How effective are AI-narrated voice-over presentations in replicating traditional instructional delivery methods, as measured by student performance outcomes on the FAA Part 107 exam?

By exploring this question, the study aims to provide insights into the potential of AI-narrated lectures in online education.

Literature Review

Artificial Intelligence in Online Higher Education

Artificial Intelligence in Education (AIEd) refers to the integration of AI technologies and applications in educational environments to facilitate teaching, learning, and decision-making processes (Hwang et al., 2020). In the context of online higher education, AI has been leveraged to support various aspects, including instructional design, automated assessments, and student performance prediction (Almeda et al., 2018; Aluthman et al., 2016; Christudas et al., 2018; Moreno-Marcos et al., 2019). AI can function as an intelligent tutor, observing students learning processes, analyzing their performances, and relieving instructors of repetitive tasks (Chen et al., 2020a, b; Hwang et al., 2020). From the learner's perspective, AIEd aims to offer personalized learning guidance and support based on individual characteristics and preferences (Hwang et al., 2020). However, the effective implementation of AI in education requires addressing challenges such as ensuring transparency, ethical use of data, and maintaining a balance between automation and human interaction (Johnson et al., 2023; Shahzad et al., 2023).

Best practices in Online Education

Engaging students and ensuring mastery of course content is a challenge in online learning environments. Best practices include creating a positive and collaborative learning environment, using interactive teaching strategies, incorporating multimedia resources, and optimizing technology for virtual engagement (Albert et al., 2022; Avantika et al., 2021; ISFOC et al., 2022; Sahu et al., 2022). Creating a sense of community and collaboration is crucial in online courses. Strategies such as collaborative learning activities, small group work, and facilitating discussions can foster a collaborative environment (Avantika et al., 2021; ISFOC et al., 2022; Pearson et al., 2020). Utilizing appropriate technological tools and platforms is essential for successful online education delivery. This includes selecting suitable learning management systems, video conferencing tools, and ensuring instructors are familiar with the technology they are using (Albert et al., 2022; ISFOC et al., 2022; Pearson et al., 2020).

Best practices in online education often involve the use of advanced tools and platforms to enhance learning and engagement. For instance, learning management systems such as Blackboard and Canvas have been widely employed to streamline course delivery and management, while collaborative tools like Microsoft Teams and Zoom facilitate virtual interaction and group activities (Albert et al., 2022;

Avantika et al., 2021). Incorporating these tools not only supports effective communication but also helps in fostering an interactive and collaborative learning environment (Albert et al., 2022; Avantika et al., 2021).

Implementation of AI in Online Education

Incorporating AI into online education platforms requires identifying integral points of entry, understanding AI's capabilities, and ensuring ethical and transparent use of data (Neendoor et al., 2023). Educators should explore AI applications that aid in managing administrative tasks and enhancing the learning experience while maintaining human interaction (Shahzad et al., 2023). AI has the potential to improve personalized learning by analyzing student data, tailoring curricula based on individual preferences and knowledge levels, and providing personalized feedback and resource recommendations (AI - OET et al., 2023; Neendoor et al., 2023). Traditional curricula often teach to the middle or common learning pathways, but AI can anticipate and address variations in how students learn successfully (AI - OET et al., 2023). Effective implementation of AI in online education involves aligning AI technology with educational objectives, balancing automation with human interaction, and ensuring proper policies and support frameworks are in place (AI - OET et al., 2023; Johnson et al., 2023; Shahzad et al., 2023).

Strategies such as personalizing learning, offering intelligent tutoring, automating content creation, and providing powerful analytics can enhance student engagement and learning outcomes (Johnson et al., 2023). The integration of AI in education has revolutionized personalized learning pathways, enabling tailored educational experiences that cater to individual learner needs. Tapalova and Zhiyenbayeva et al. (2022) highlight the transformative potential of AI technologies in crafting personalized learning systems. These systems utilize advanced analytics to adapt content dynamically, offer immediate feedback, and align learning strategies with individual student profiles (Tapalova & Zhiyenbayeva et al., 2022). This capability underscores the relevance of AI-narrated voiceovers, which can deliver consistent, high-quality educational content while addressing the unique needs of diverse learners (Tapalova & Zhiyenbayeva et al., 2022). The adaptation of AI for personalized learning has shown benefits such as increased engagement, efficient knowledge transfer, and enhanced learning outcomes in both traditional and online education settings (Tapalova & Zhiyenbayeva et al., 2022).

The literature review highlights the potential of AI in online education, best practices for effective online teaching and learning, and strategies for incorporating AI into educational platforms. While AI offers opportunities for personalization, automation, and enhanced learning experiences, maintaining a balance with human interaction and addressing implementation challenges are important considerations.

Methodology

Research Design

This study employs a quantitative analysis method to compare exam scores data of students. The study aims to evaluate the effectiveness of AI-narrated voice-over presentations in online education by measuring student performance in the FAA Part 107 knowledge exam. The methodology starts with a literature review to understand AI's role in online learning. Next, a workflow is created to generate AI voiceovers for a drone course. The methodology then involves comparing and analyzing Part 107 exam scores between traditional and AI-assisted instruction. This is followed by analyzing student's

performance quantitatively, concluding with a discussion of the findings. The AI voice used in this study was chosen for its perceived neutrality and clarity, aligning with the needs of a standardized educational setting. Participant demographics included students across diverse backgrounds to ensure varied perspectives. Figure 1 shows the methodology used for this study. Step two identifies "The Workflow," which describes how the narration of traditional human-narrated voice-over presentations was re-created using AI. The steps of the Workflow are described in figure 2.
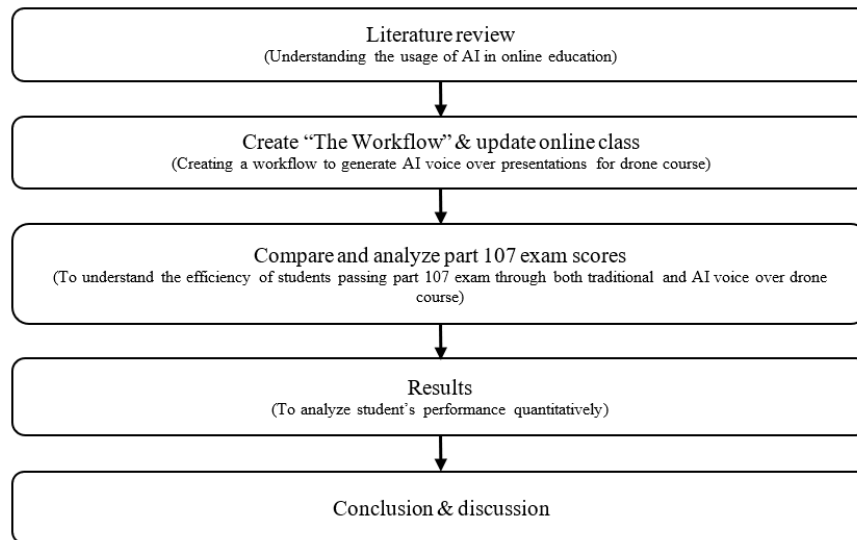
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│      Create "The Workflow" & update online class  │
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│        Compare and analyze part 107 exam scores   │
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Figure 1. Phase wise representation of stages involved in methodology.

Steps of "The Workflow"

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│ Step 1. Create transcripts by extracting audio    │
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│ Step 2. Clean the transcript using ChatGPT &      │
│           fine tune final transcript              │
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│ Step 3. Create audio lecture file from fine-tuned │
│           transcript                              │
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│ Step 4. Create close caption files from audio     │
│ files & recreate human lecture with AI-generated  │
│           material                                │
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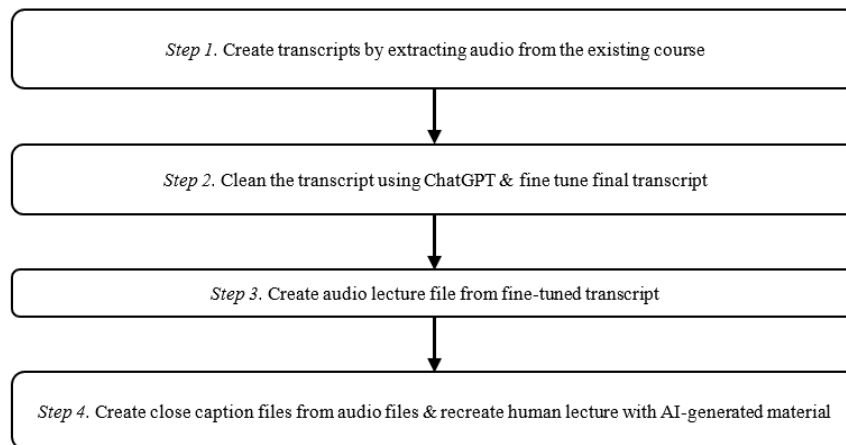
Figure 2. Step wise workflow for creating AI-narrated lecture

Step 1. Create transcripts by extracting audio from the existing course: Initially, audio was extracted from the existing human voice-over presentations. These audio files were then converted into

transcripts using an online transcript converter (KwiCut) and further refined with the assistance of ChatGPT.

Step 2. Clean the transcript using ChatGPT & fine-tune the final transcript: Using ChatGPT to clean the transcript, the researchers employed the prompt: "I am a college professor and have the transcripts of a lecture I gave from a PowerPoint. The lecture was about preparing my students to pass the FAA's Part 107 knowledge test so they could earn their remote pilot certificate. The exam is a standardized test. I will give you a transcript of my lecture and I would like for you to take each individual sentence and rephrase it independently. The tone should be of a pleasant professor. There are 40 slides. I will give them to you in groups of 5 slides at a time." Initially, they edited the transcript for each slide using ChatGPT 3.5, creating one set of transcripts for review, and then refined it further using ChatGPT 4.0 to generate another set for evaluation. The transcript was subsequently proofread manually, with "Track Changes" used to assess and enhance content accuracy. Human-proofread transcripts were deemed the most effective for initial revisions and were further refined using ChatGPT 4.0 with the simplified prompt: "I am going to give you paragraphs that I would like for you to rephrase." This final step resulted in the most accurate and efficient transcript for use.

Step 3. Create audio lecture file from fine-tuned transcript: Upon completing all revisions to the final transcript using ChatGPT 4.0, the researchers prepared it for audio generation by first verifying pronunciations with the "Read Aloud" feature in Word. The finalized transcript was then imported into the text-to-speech application ElevenLabs, where the default Antoni voice was chosen for its natural and human-like quality, as attempts to create a custom voice resembling the professor's voice resulted in overly artificial output. To address audio distortion caused by longer transcripts, the researchers divided the content into smaller sections and regenerated the audio, significantly improving the quality and ensuring consistency for subsequent audio files. The choice of the "deep American male accent" voice profile was based on its clarity and neutrality, aligning with audience expectations for professional and standardized educational content. This selection aimed to minimize bias and distractions associated with specific voice characteristics, thereby ensuring the focus remained on the content rather than the delivery.

Step 4. Create close caption files from audio files & recreate human lectures with AI-narrated material: After extracting the final audio files from the transcripts, the researchers created closed captions using the "KwiCut" software, selected for its affordability and practicality. The captions were exported in "SRT" format and uploaded into Storyline, a presentation software. The researchers then manually proofread and refined the captions to ensure they were error-free, recreating the human lecture presentations within Storyline using the AI-generated content. The human audio files in the presentations were replaced with the AI-generated audio, and the SRT caption files were incorporated. Finally, the researchers synchronized the animations in the presentations with the new narration, completing the integration of audio and captions for the lectures.

Example of Human narrated lecture: https://demo-drone-course.s3.amazonaws.com/course1/human-voice-presentation/story.html

Example of AI narrated lecture: https://demo-drone-course.s3.amazonaws.com/course2/ai-voice-presentation/story.html

The findings of this study align with prior research that highlights the potential of AI in education to deliver consistent and high-quality content (Hwang et al., 2020; Tapalova & Zhiyenbayeva et al., 2022). Similar to the work of Almeda et al. (2018), our results demonstrate that AI can match human educators in delivering standardized instructional material without compromising outcomes. However, this study also supports critiques by Chen et al. (2020) regarding the lack of engagement and emotional tone in AI-based delivery, an area warranting further exploration. These findings reinforce the utility of AI for task standardization but suggest a need for hybrid approaches to address nuanced aspects of teaching, such as empathy and engagement.

Results

Quantitative Analysis

Participants were divided into two groups. The control group was made up of students from two online classes who prepared for the Part 107 knowledge exam using traditional human-narrated presentations. The experimental group was made up of students who took the same online course; however, they prepared for the Part 107 knowledge exam with presentations where the script and narration were generated by AI. Data on participants' Part 107 knowledge test scores were collected. There were 59 students who completed the traditional human voice-over course and took the Part 107 knowledge test in the Fall 2023 and Spring 2024 semesters. There were 11 students who completed the AI voice-over course and successfully completed the Part 107 knowledge test in the Summer 2024.

Table 1

T-test table for Part 107 Knowledge Test Scores

t-Test: Two-Sample Assuming Unequal Variances		
	Control Group Students	Experimental Group Students
Mean	85.22033898	86.61818182
Variance	38.23130333	43.65963636
Observations	59	11
Hypothesized Mean Difference	0	
df	13	
t Stat	-0.65054335	
P(T<=t) one-tail	0.263336134	
t Critical one-tail	1.770933396	
P(T<=t) two-tail	0.526672269	
t Critical two-tail	2.160368656	

A T-test was conducted between the control group and the experimental group students. The Mean exam score difference between the two groups was only 1.398 points out of a maximum 100. The null hypothesis for this test is "There is no significant difference between Students Part 107 knowledge test results" and the Alternate hypothesis is "There is significant difference between Students Part 107

knowledge test results." As the P-value is 0.526 which is greater than α value 0.05. There is no significant difference between the control and experimental groups Part 107 knowledge test results. As such, the researchers concluded that the AI voice-over course delivered equivalent Part 107 test outcomes as the human voice-over course. Additionally, the participants were assigned to groups based on the semester they enrolled in the course, with efforts made to ensure that both groups were comparable in terms of demographic diversity and prior knowledge of the subject. Any potential biases due to this assignment method are acknowledged as a limitation of the study.

Conclusion

This study evaluated the effectiveness of AI-narrated voice-over presentations compared to traditional human-narrated presentations for students preparing for the FAA's Part 107 knowledge test. Our findings indicate no significant difference in student performance, suggesting that AI-narrated lectures are a viable alternative to human-narrated ones in online education.

However, the study faced limitations, including a small and unbalanced sample size, which restricts the generalizability of the results. Future research should employ larger and more balanced samples to validate these findings and explore other outcome measures, such as student engagement, satisfaction, and long-term retention.

Additionally, integrating AI-narrated lectures with supplementary tools, such as interactive chatbots, could enhance the learning experience. Exploring these combinations could further establish AI's role in improving online education's accessibility and effectiveness.

Discussion

The workflow developed in this study could be highly useful in the real world, particularly in digitizing teacher's lectures. This would be beneficial if a teacher is no longer available to teach the class, such as when a PhD student graduates or a faculty member retires. By digitizing their lectures, the department can continue to benefit from their knowledge and teaching without their physical presence. Digitized lectures also become "generic," meaning they are not owned by any specific faculty member. This is advantageous for instructors who may not want to teach using another professor's specific presentation style. Additionally, the workflow allows for easy updates with new data, even if the original lecturer is no longer available to record new material.

While this study focused primarily on test scores as a measurable outcome, it is important to acknowledge that human-narrated lectures may have additional impacts on mental health and perception. Factors such as the emotional tone of a human voice, its ability to convey empathy, and its influence on listener engagement could affect learners' overall experience and satisfaction. These aspects were beyond the scope of this research but warrant further exploration in future studies to provide a more holistic understanding of the comparative effectiveness of human and AI-narrated voiceovers.

While not part of this paper, this workflow could further support learning by integrating a chatbot trained on the lecture transcripts and other course materials. This chatbot could answer student queries, provide additional explanations, and offer personalized assistance, enhancing the overall learning experience. This combination of AI-narrated lectures and an interactive chatbot could

significantly improve the efficiency and accessibility of education, making it more adaptable to changes in faculty and updating educational content.

Limitations & Future studies

The unbalanced sample size between the control (59 participants) and experimental (11 participants) groups is a limitation. This discrepancy reduces the statistical power of the analysis, limiting the ability to detect small yet potentially meaningful differences between the groups. Test scores on the FAA Part 107 knowledge test were chosen as the primary variable for this study because they provide a standardized, objective measure of student learning outcomes. Additionally, no confidence intervals were calculated due to the small sample size, which further constrains the generalizability of the findings. This metric directly aligns with the course's goal of preparing students for certification, offering a clear basis for comparing the effectiveness of AI-narrated and human-narrated presentations.

Beyond the small and unbalanced sample size, this study is limited by its sole reliance on test scores as a measure of effectiveness. Engagement, satisfaction, and other qualitative outcomes were not assessed, which could provide a more holistic understanding of the impact of AI-narrated presentations. Additionally, the study did not consider variations in students' learning preferences or accessibility challenges, which might influence outcomes in diverse educational settings.

Future studies could explore hybrid models that combine AI-narrated lectures with human interaction to address emotional tone and engagement gaps. Research on integrating AI tools, such as adaptive learning platforms or chatbots, could also provide insights into their synergistic potential in education.

Note: This paper utilized ChatGPT for grammatical proofreading and rephrasing of the text. No factual information, data, or reference citations were sourced or generated using ChatGPT. All research content and references are original and derived from the author's own work and verified sources.

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