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# Leveraging GenAI to Transform a Traditional Instructional Video into Engaging Short Video Lectures

**Hua Zheng** Tuesday, June 17, 2025

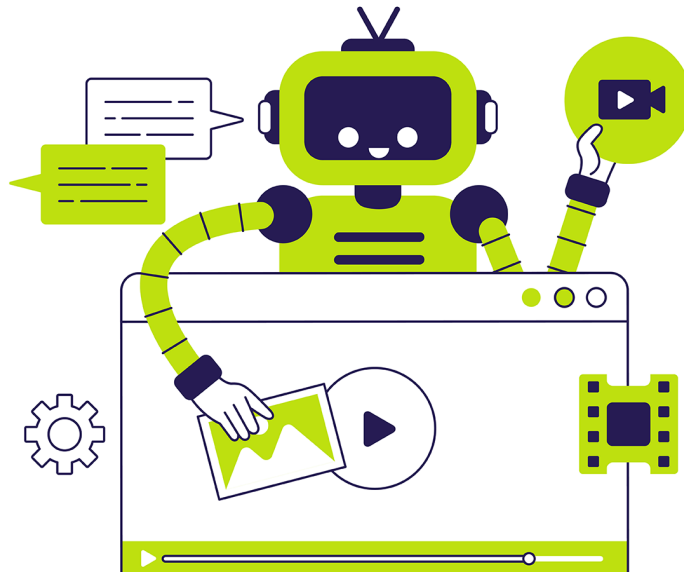
**Emerging Technologies and Trends, Teaching and Learning**

13 min read



By leveraging generative artificial intelligence to convert lengthy instructional videos into micro-lectures, educators can

enhance efficiency while delivering more engaging and personalized learning experiences.



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Dr. Thomas, a seasoned professor of instructional design, observed that her longer instructional videos had low engagement, while her microlectures consistently attracted higher viewer interaction. The idea of redesigning these lengthy videos into short, engaging lectures with interactive elements—such as quizzes and discussion prompts—had been on her mind for some time. However, the time-consuming nature of the task had held her back.

Thomas had recently taken courses and read articles exploring various approaches to applying generative artificial intelligence (GenAI) in education, which inspired her to use the technology to revamp one of her longer instructional videos. She meticulously planned the project and successfully transformed

a lengthy chapter video into a series of meaningful and engaging video lectures.

## Introduction

GenAI can quickly and efficiently transform a lengthy instructional video into an engaging video lecture series. It is important to note that although GenAI tools can enhance the quality of course materials and increase student engagement, videos created with the help of GenAI tools may lack the personal touch and creativity that those created by human educators possess.<sup>1</sup> To maximize the effectiveness of the videos and improve learning outcomes, high-quality input data, including personalized interactive elements, are crucial.

A variety of tools are available to help educators streamline video production; create informative, engaging, and customized videos; and facilitate content mastery. When used appropriately, GenAI tools can add value to the higher education student's experience.

## The Benefits of Using GenAI to Develop Instructional Videos

GenAI can use existing data to generate a range of content types, including text, images, videos, audio, code, and 3D designs. Given its extensive content generation capabilities, Thomas wanted to try using GenAI tools to transform one of her lengthy instructional videos (in this case, her chapter 3

lecture materials) into an engaging series of short video lectures.

She said that she found GenAI to be like a master sculptor. It quickly and efficiently chiseled away excess material from a lengthy instructional video, revealing a series of concise, engaging segments; generated a structured outline, enabling Thomas to tailor her video content to better meet her students' needs; and helped her to integrate customized elements into each video lecture, turning a passive viewing experience into an interactive one, improving student engagement and knowledge retention.<sup>2</sup>

Thomas said that another game-changing benefit of using GenAI in this context is the substantial boost in productivity it enabled. She explained that GenAI quickly generated detailed video scripts and storyboards from the content she provided, significantly reducing the time it would have taken to prepare each video using traditional production methods. This process allowed her to focus on creating high-quality, engaging content without being bogged down by time-intensive tasks.<sup>3</sup> She said it was like having a creative partner who never slept and was always ready to help, freeing up valuable time for her to engage directly with her students.

## **Content Architecture for Using GenAI to Develop an Instructional Video Series**

To transform her chapter 3 lecture video into an instructional video series, Thomas used specific prompts, provided context,

guided the AI's response, and reviewed and revised the outputs to ensure they met her needs.

## Prompting

Using GenAI begins with prompting. Much like a GPS, GenAI must be prompted to generate the desired content. Thomas included the following four key components in her prompts:<sup>4</sup>

- **Goal:** Thomas clearly defined what she wanted to achieve. Goal setting is like inputting a destination on a GPS. For example, "Create a five-minute video summarizing the key points of chapter 3."
- **Context:** She explained why she needed the content and who it was for—much like explaining the purpose of a trip. For instance, "I need this video to help my students understand the main concepts of chapter 3 before the upcoming quiz."
- **Expectations:** Thomas specified how GenAI should fulfill her request. This step is akin to choosing a preferred route on a GPS (the fastest or the most scenic). For example, "Respond with a tone that is friendly but authoritative, and include visual aids to illustrate key points."
- **Source:** She indicated what information the GenAI tool should use—like providing the GPS with waypoints or landmarks. For instance, "Use the textbook and my lecture notes from the last two weeks as references."

## Content Structuring

Content structuring involves organizing instructional material in a logical and coherent manner. It includes creating a detailed content outline that breaks down complex topics into manageable, short segments. This approach facilitates student learning by making the material more digestible and engaging.<sup>5</sup>

Thomas followed the steps below to structure her instructional content and ensure that her videos were well-organized, coherent, engaging, and easy to follow:

1. **Segmenting:** This involves dividing a larger body of information into smaller, meaningful parts. Thomas segmented her chapter 3 lecture video by uploading the transcript to the AI and then prompting the AI tool to generate short segments, each focusing on a single key concept or specific skill. Shorter videos provide a more appropriate cognitive load and facilitate engagement and learning more effectively than longer videos.<sup>6</sup>

#### ***Example Prompt***

- "Break down this transcript into short segments, each focusing on a single key concept or specific skill."

2. **Mapping:** This step involves planning and organizing the structure and flow of each content piece. Thomas prompted the AI tool to generate a content outline by identifying subheadings for each segment of chapter 3. This outline served as a roadmap to guide her students through the material. To enhance clarity and

organization, Thomas used bullet points to list key concepts and subtopics under each subheading. She instructed the AI to generate these bullet points accordingly. This structured approach streamlined the content creation process and made the content easier for her students to navigate and understand.

### ***Example Prompts***

- "Generate a content outline for chapter 3. Include subheadings for each segment."
- "For each segment, provide bullet points outlining key concepts and subtopics."

**3. Reviewing and revising:** For this step, Thomas evaluated the AI-generated content to ensure accuracy, clarity, and instructional effectiveness. She reviewed the content outline and prompted the AI to add supporting information that would help learners develop a comprehensive understanding of the topics covered in chapter 3. This step ensured clarity, improved organization, and enhanced the overall quality of the material. It also helped Thomas to identify and correct errors, making the content more accurate and reliable.<sup>7</sup>

### ***Example Prompts***

- "Review the content outline and suggest any necessary revisions for clarity and organization."
- "Add supporting information to each segment to help learners understand the topics better."

# Content Personalization

Thomas integrated content personalization to ensure her instructional materials met the individual needs of learners—much like having a suit tailored to fit the wearer perfectly. This approach enhanced student engagement and learning outcomes by making the material more relevant, accessible, and responsive to individual differences.

The following steps detail how Thomas personalized her content using GenAI:

1. **Segmenting scripts:** Segmentation enables more precise customization of instructional content. Thomas observed that segmentation can occur either during or after the content structuring process (i.e., breaking down the content by key concepts or specific skills) by prompting the AI tool to perform this task.<sup>8</sup>

## *Example Prompt*

- "Segment the script into parts that focus on key concepts or specific skills."

2. **Analyzing learner data:** Understanding learners is foundational to effective instructional design. Thomas began by using GenAI to analyze both her previous and current students' data, including demographic information, video interaction and behavioral patterns, performance on chapter 3 video assignments, and self-reported data. This analysis helped her identify patterns in student understanding, common areas of difficulty, and variations in learning needs. By

leveraging these insights, she was able to prompt the AI to generate instructional videos that were more personalized and pedagogically aligned with her students' needs.

### ***Critical Types of Data to Analyze<sup>9</sup>***

- **Demographic data** includes factors such as age, gender, academic background, language proficiency, and prior experience with the subject. This data helps identify potential learning barriers, cultural considerations, and accessibility needs. These insights support the creation of more inclusive and learner-centered instructional video content.
- **Video interaction data** focuses on direct engagement with the video player, including watch time, rewatch frequency, skip rates, engagement peaks, and drop-off points. Analyzing how students interact with videos helps identify which segments are most and least engaging. These insights can inform adjustments to video pacing, length, and content emphasis.
- **Behavioral data** captures how students manage their learning around the video experience, including when they choose to watch (e.g., before tests) and how they pace themselves (e.g., pausing to take notes, rewatching difficult sections). This data helps to uncover students' underlying study habits, time

management strategies, and self-regulated learning behaviors.

- **Performance data** directly measures academic outcomes and mastery of the video content. This includes metrics such as quiz and test scores, assignment grades, and video watching completion rates. This data highlights areas of student strength and identifies where additional support is needed.
- **Self-reported data** gathers students' perspectives of video-based learning experiences through surveys, questionnaires, and self-assessment. This data offers insights into student learning preferences, motivations, and any challenges they perceive.

### ***Example Prompts***

- **Demographic data:** "Analyze demographic data (e.g., academic background, language proficiency) to identify if specific subgroups face learning barriers or have distinct accessibility needs when interacting with instructional videos."
- **Video interaction data:** "Identify specific engagement peaks and drop-off points within chapter 3 content and hypothesize what content or pacing elements contribute to these patterns."

- **Behavioral data:** "Based on behavioral data, identify common self-regulated learning (SRL) strategies students employ (e.g., pausing for notes, rewatching difficult sections), and analyze how these strategies impact overall video engagement and learning outcomes."
- **Self-reported data:** "Analyze self-reported data from student surveys to uncover prevailing learning preferences, common motivations, and frequently reported challenges students encounter while using instructional videos for chapter 3."

By leveraging these diverse data types, Thomas was able to create a more supportive and effective learning environment that adapted to the unique needs, behavior, and preferences of each student.

**3. Personalizing and adjusting instructional content:** AI systems analyze student data (e.g., engagement, SRL strategies, and performance) to personalize video-based instruction. This enables real-time adjustments to the content, ensuring that each student receives the appropriate level of support or challenge during the learning experience.<sup>10</sup>

For example, Thomas utilized AI-driven insights to adapt the difficulty of quizzes that assessed video comprehension, automatically provide supplementary

resources to students who were struggling, and offer advanced materials to those who had demonstrated mastery. She also used AI to interpret detailed video engagement data, such as time spent on specific lecture engagements and interaction logs, to identify which SRL strategies students were employing while watching the videos and understand how these strategies influenced their learning outcomes. This sophisticated analysis allowed her to deliver highly targeted support that actively promoted better time management, effort regulation, and overall engagement with video content for each student.

### ***Example Prompts***

- **To identify areas of struggle:** "Analyze performance data (quiz scores, assignment grades related to chapter 3) and video interaction data (rewatch frequency, drop-off points) to identify specific learning concepts presented in the videos that students consistently struggle with and may need additional help with."
- **To adjust quiz difficulty:** "Based on individual student performance data on the chapter 3 assessments (quiz scores, response times), adjust the difficulty level of subsequent quizzes to maintain on optimal challenge."
- **To provide supplementary resources:** "For students scoring below a threshold on the chapter 3 quizzes, automatically suggest relevant supplementary videos or practice

exercises that address their identified knowledge gaps."

- **To offer advanced materials:** "For students who demonstrate mastery of the chapter 3 content through high quiz scores and assignments, propose advanced materials or challenge problems to extend their learning beyond the core curriculum."
- **To provide personalized recommendations for SRL:** "Based on a student's observed video watching patterns and associated performance trends, generate personalized prompts or recommendations designed to enhance their time management, effort regulation, or specific study habits when engaging with instructional videos."
- **To determine learning preferences:** "Analyze students' video interaction data (e.g., watch time, rewatch frequency, skip rates) and self-reported survey data on video learning experiences to determine their dominant learning preferences, and adapt the delivery of video instruction and supplementary materials to align with their preferences."
- **To recommend supplementary videos for specific concepts:** "When a student demonstrates difficulty with a particular concept (identified by quiz performance or repeated video segments), recommend specific supplementary videos or alternative explanations focusing on that exact concept."

By following these steps, Thomas was able to create a truly supportive and highly effective video learning environment that continuously adapted to the unique needs, behaviors, and preferences of each student.

## **Integrating Interactive Elements**

In video-based online learning, interactive elements, such as quizzes and discussion prompts, serve as learning checkpoints, ensuring that students remain actively engaged with the content and can assess their understanding of course concepts. When integrated into video-based learning, interactive learning elements enhance knowledge construction and improve learning performance.<sup>11</sup>

Thomas developed interactive elements following these key steps:

1. **Preparing content for interaction:** Once the content for each video lecture was ready, Thomas began developing interactive elements.

### ***Example Prompt***

- "Identify key points in the video where interactive elements, such as quizzes or discussion prompts, can be added."

2. **Aligning with learning outcomes:** Interactive activities should align with the specific segment and the targeted learning outcomes. This ensures that the activities are relevant and appropriately challenging for students. For example, Thomas used GenAI to develop

interactive activities that align with both the target learning outcomes and the cognitive levels of Bloom's Taxonomy (see table 1).

### ***Example Prompts***

- "Create a quiz that aligns with the learning outcome of 'understanding' for this segment."
- "Generate discussion prompts that encourage critical thinking and align with the 'analyzing' cognitive level."

3. **Using an assessment matrix:** Thomas developed a template to plan and organize the interactive elements. The template aligned the activities with the learning outcomes and cognitive levels (see table 1).<sup>12</sup>

### ***Example Prompt***

- "Fill in the assessment matrix with the number of quizzes and discussion prompts for each learning outcome and cognitive level."

**Table 1. Assessment Matrix Template**

| Video 1:<br>[Title] | Target Learning Outcomes (LOs) | Cognitive Level | Number of Quizzes | Number of Discussion Prompts |
|---------------------|--------------------------------|-----------------|-------------------|------------------------------|
|                     | LO1                            | Remembering     |                   |                              |
|                     |                                |                 |                   |                              |

|  |     |               |  |  |
|--|-----|---------------|--|--|
|  |     | Understanding |  |  |
|  |     | Applying      |  |  |
|  |     | Analyzing     |  |  |
|  |     | Evaluating    |  |  |
|  |     | Creating      |  |  |
|  | LO2 | Remembering   |  |  |
|  |     | Understanding |  |  |
|  |     | Applying      |  |  |
|  |     | Analyzing     |  |  |
|  |     | Evaluating    |  |  |
|  |     | Creating      |  |  |
|  |     | Remembering   |  |  |

By following the steps above, Thomas not only developed interactive elements that aligned well with her learning outcomes but also ensured that her instructional videos were engaging, interactive, and effective.

## Using Text-to-Video GenAI to Generate a Video Lecture Series

While text-based GenAI tools are highly effective for developing outlines, scripts, and interactive materials for instructional videos, they typically do not support video

creation. To move beyond text, Thomas turned to advanced text-to-video GenAI tools to create an engaging and professional video lecture series from her content outline and segmented scripts. This video-focused approach significantly improved the efficiency and effectiveness of the video content and helped her achieve greater consistency across the series.

Using video GenAI included several key steps:

**1. Generating videos with multimedia integration:**

Thomas used the prepared content outline, segmented scripts, and interactive elements to generate a video lecture series. GenAI analyzed the provided content, added visual elements, and generated voiceovers to produce professional-quality videos. Thomas integrated avatars, images, and animations to make the videos more engaging and interactive.

***Example Prompts***

- "Use the content outline and segmented scripts to generate a video lecture series."
- "Generate a video lecture for the segment titled 'Understanding' from the content outline."
- "Add visual aids, avatars, and animations to the video lecture titled 'Analyzing' from the segmented scripts."
- "Incorporate relevant images and diagrams to enhance the explanation of key concepts."

**2. Reviewing and customizing the videos:** After the AI tool generated the video series, Thomas reviewed them

to ensure they met the desired quality and educational standards. She further customized the videos by adding specific examples, annotations, and branding elements.

### ***Example Prompts***

- "Review the generated video for factual errors, unclear explanations, and alignment with course goals. Flag unclear or incorrect content, and identify where examples or annotations should be added."
- "Add annotations to highlight key points in the video lecture titled 'Applying.'"
- "Insert instructor-provided branding elements (e.g., logos, colors, fonts) in the video. Ensure all elements comply with the provided institutional branding guidelines."
- "Add personalized introduction using the instructor's avatar. Ensure the tone and visuals align with the instructional style and audience of the course."

Following these steps enabled Thomas to produce a high-quality, well-organized, engaging video lecture series that was tailored to her students' learning needs.

## **Closing Remarks**

Thomas' experience illustrates the transformative power of GenAI in higher education video production. She not only streamlined a lengthy lecture into a series of concise,

engaging, and logically structured videos but also leveraged GenAI to deeply analyze student engagement data. This analysis empowered her to personalize and adapt instructional video content and interactive learning experiences in real time, fostering a truly supportive and highly effective video learning environment tailored to each student's unique needs, behaviors, and learning preferences.

Beyond content refinement, Thomas embraced text-to-video GenAI to elevate her instructional materials, crafting dynamic, a well-organized, professional video lecture series precisely matched to her students' learning styles. Her journey underscores the game-changing benefits of GenAI. Ultimately, Thomas' experience illustrates that GenAI can be an invaluable ally for educators, boosting their productivity and creativity and revolutionizing how they produce and deliver student-centered video learning experiences.

## Notes

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