



# Enhancing Pedagogy with Generative AI: Video Production from Course Descriptions

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## ABSTRACT

This paper explores a novel workflow that integrates Generative AI tools, ChatGPT and DALL·E, into educational use, aiming to improve the traditional teaching methods in university education. Our workflow is focused on creating short introductory videos for university courses, using primary course descriptions available in the university's study guide with the idea of introducing courses visually. This approach was deliberately selected for experimentation, and we believe that it could be further enhanced to generate course videos on specific course topics. This will minimize the efforts of teachers who are required to produce detailed course videos as a part of their teaching.

As the first part of our workflow, we present a tool that utilizes ChatGPT-4 and DALL·E 2 to autonomously generate a script and background graphics for videos, using primary course descriptions extracted through a given course web URL. As the second part of the workflow, we combine those generated artefacts into videos using Narakeet, a Text-to-Speech software service that is available online. To analyze the feasibility of this workflow, we then conducted a field survey where university teachers participated in reviewing introductory course videos of their courses generated through our workflow. We employed only engineering courses that are English-taught in this field survey.

The results demonstrate the potential of AI-generated content to increase the efficiency of teachers when creating video materials. However, challenges such as the uncanny valley effect in text-to-speech narration and the propensity for AI-generated misinformation highlight the need for careful review by humans on such content before setting it for wider use. This paper argues for the strategic integration of AI in university education, focusing on the benefits, while acknowledging the limitations owned by generative AI tools.

## CCS CONCEPTS

• Applied computing → Education; • Software and its engineering → Development frameworks and environments.



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## KEYWORDS

Generative AI, AI in Education, Pedagogical Tools, ChatGPT, DALL·E

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## 1 INTRODUCTION

The integration of Artificial Intelligence (AI) into educational settings has become more than a mere trend today. When ChatGPT was introduced by OpenAI on November 2022 [7], it sparked a transformative wave in many research areas including teaching and learning, with its potential as a Generative AI tool. ChatGPT is an artificial intelligence model for processing natural language that was developed by OpenAI. It utilizes the Generative Pre-trained Transformer (GPT) technology [16], which is an autoregressive system designed to emulate human-like text through deep learning algorithms [3]. ChatGPT has been extensively trained on large volumes of data, enabling it to comprehend natural language and deliver insightful, appropriate responses to user questions [3].

Generative AI has shown the ability to achieve educational goals more effectively, at a reduced expense and on a larger scale [24]. According to a survey done in the USA with K–12 educators and students aged 12–17, 30% educators have used ChatGPT to organize lessons and encourage innovative classroom ideas, and 27% have relied on it to improve their subject-matter expertise. [24].

Recently developed commercial tools, such as InVideo [6], Synthesia [20], and VEED [23], can facilitate the video production process through the application of AI technologies. However, a notable limitation is the scarcity of platforms capable of script generation, with InVideo [6] being one of the few exceptions [21]. As a result, users are often required to manually write scripts for most of these tools. Furthermore, those tools that offer template generation rely on simplistic prompts [21], casting doubt on their ability to produce videos on educational content with such restricted input. On the other hand, access to the entire list of functionalities offered by these tools comes with a financial cost and the customization may be limited.

This study aims to introduce a novel workflow to generate introductory course videos as autonomously as possible by utilizing OpenAI's generative AI tools, ChatGPT-4 and DALL·E 2. We use primary course descriptions to generate videos at this level of the study. Therefore, the generated videos provide a visual introduction to the course and not a detailed elaboration on a specific course

topic. The target audience of this research is university teachers, yet, the experimented workflow can be employed suitably by any interested party. Through this study, we expect to address the research gap in the applicability of generative AI tools in university education. Despite ChatGPT's sophisticated capabilities, it lacks actual consciousness [2]. Therefore, it has a tendency to provide incorrect or misleading responses, a phenomenon often referred to as "hallucinations" [2]. This highlights the need for cautious application of the generated content and evaluation of its outputs. Further, our study does not address ethical issues or other unanswered topics [19] about AI-generated material.

In May 2024, OpenAI introduced ChatGPT-4o, which retains the intelligence of GPT-4 while offering enhanced speed and improved functionalities in text, voice, and vision [14]. Also, DALL-E 3 was introduced as a part of ChatGPT [12] in October 2023. The capabilities of these new versions improve a lot the results presented in this study.

The paper is structured as follows. Section II describes related studies conducted by different researchers while Section III explains the methodology used to conduct these experiments. Section IV discusses the results of the feedback survey and observations in detail. The Final Section concludes the findings of our study and proposes future work.

## 2 LITERATURE

A recent study [24] highlights the widespread adoption of ChatGPT among K-12 educators and students aged 12-17 in the USA, revealing its significant potential in education. Over 50% of teachers and 33% of students have been actively using ChatGPT for educational purposes [24]. This data emphasizes ChatGPT's role in modernizing the existing pedagogical methods and learning experiences.

A study conducted in the Philippines [5] researches the role of ChatGPT in developing a micro-level framework for Educational Technology (EdTech). It has been observed that when it comes to pedagogical support, ChatGPT steps in as a virtual compass, providing instructors with instant support, clarifications, and direction. It has exhibited the capacity to respond to inquiries, elucidate ideas, and offer step-by-step assistance according to the requirements and learning preferences of specific pupils.

Research conducted by Rytlahti et al. [17], in 2023, presents a novel approach to programming exercise generation, exercise translation, course reviewing and video generation by utilizing the generative AI tools. The video generation tool that is being discussed in this paper and the entire workflow were released for the usage of university teachers in November 2023.

Another study [18] explored the utility of AI-generated exercises for beginner and intermediate programming courses. Twelve exercise sheets were developed and refined using the AI, focusing on an objects-first approach. These were then implemented in a course at the University of Education at Ludwigsburg, with student feedback assessing their quality. Results suggest that while ChatGPT accelerates exercise creation, minor manual adjustments are often necessary to ensure optimal quality. This research again contributes insights into the practicalities and limitations of employing AI in programming education.

A research done in 2023 [1], investigates AI's potential to improve teaching and evaluation methodologies, as well as its role in

facilitating continual skill improvement and professional progress. It further explores the influence of AI on educational fairness and accessibility.

According to a study [4] done in 2023, that examines a total of 276 publications, it was found that the top three nations for AI research in online and remote learning are China, India, and the US. Engineering and computer science are the research fields that contribute the most. Furthermore, AI technologies in online distance education are radically enhancing the teaching and learning process through learning analytics, educational data mining, and artificial intelligence for customized and adaptive learning.

## 3 METHODOLOGY

Our research was exploratory and of an empirical nature. In this research, we experimented to find answers to the below research questions.

**RQ1:** Can ChatGPT-4 [11], DALL-E 2 [13] and Narakeet [9] be used to automate the existing process of video generation?

**RQ2:** Can university teachers benefit from an integrated tool that can generate videos?

Based on them, we defined the scope of the research as below.

- (1) Video Topics: Generate short (between 1-5 minutes) introductory videos for a selected set of the University of Turku's master studies courses that are taught in English. We utilized the course description available in the University of Turku's study guide [22] for the videos. Therefore, videos will be an audio-visual presentation about the course and will not include specific course topics.
- (2) Audience: Teachers of the selected set of courses.
- (3) Tools: Generate all essential artefacts for a video by using ChatGPT-4 and DALL-E 2. After that, utilize a Text-to-Speech software, named Narakeet to automate the video generation process. This software has certain conditions to follow in the script to generate the final video. The final script should be readable by both ChatGPT and Narakeet.

Furthermore, a multimedia video generally consists of the following components:

- (1) Audio artefacts. E.g.: audio narration, music in the background
- (2) Visual artefacts. E.g.: images, illustrations, text in the video
- (3) Script

Our video generation tool was able to generate all the above artefacts after giving the web URL of the course in the study guide[22].

### 3.1 Defining the script for the video

A key requirement to create a video is having a specific flow for its delivery. Based on the audience, topic(s) covered and tools at hand, the delivery plan of the video can be structured into a script. Taking these aspects into consideration, we followed the rules below for generating our final video script:

- (1) What kind of text will be shown in the video? Based on the general information available in the University of Turku's study guide, we divided course information into 5 distinct topics: Key knowledge Areas, Course Delivery, Course Evaluation, Teacher Responsible, Conclusion

- (2) What kind of images will be shown in the video? Background images are needed to make the videos visually pleasing while being related to the course.
- (3) What kind of narration is required for the video? The narrator should introduce the course in the order of topics. We will further use both male and female voices in the video.
- (4) How many video scenes there should be in the video? Seven scenes including start, end and topics mentioned under 1 above.
- (5) How long a video should run? Between 1-5 minutes, length could vary depending on the text length of the script generated by ChatGPT.
- (6) What pre-defined sections there should be in each video other than key topics? The video should end with the university's logo and the university's outro music clip should be used.
- (7) What kind of other requirements are to be fulfilled in the script? The script will be written in markdown syntax according to Narakeet[6] guidelines.

### 3.2 Extracting the course content from the web URL

In early experimentation, we observed that the ChatGPT-4 could not read and grasp the content of a web page on its own probably due to the technical incompatibility with the ChatGPT and the university study guide. When it was prompted directly with the university's study guide URL, this was the response:

"I'm unable to access content directly from the link you provided. However, if you need a summary or specific information from a course description or details listed on that page, I recommend visiting the link directly or providing some details you're interested in. This could include topics covered in the course, its objectives, assessment methods, or any prerequisites."  
[15]

Therefore, our tool first extracts the content relevant to the video from a course page of the University of Turku's study guide.

### 3.3 Prompting ChatGPT to generate narration audio and video text

Even though ChatGPT can respond to a variety of user requests, we observed that the effectiveness of its responses depends highly on how well you can tell ChatGPT what you need. We experimented with several prompts to get a generally successful prompt for our requests. The following prompts were used in the final workflow to generate necessary text artefacts for the videos in the format that could be used directly in the Narakeet text-to-speech service.

#### Prompt to generate text(bullet lists) for the video:

"A university teacher wants to create an introductory video for a course. Use these course descriptions, and goals and write 3-5 key knowledge areas (no header) relevant covered by the course. Start each area in the format of '\* key area' and separate them by two newline characters. No other details about key areas

or sub-key areas are required. Do not repeat the 'key area' as a topic in the content : "key\_areas\_list"., "

#### Prompt to generate narration script for the video:

"A university teacher wants to create an introductory video for a course. Based on the provided course descriptions and goals, generate a brief narration content with exactly 5 distinct sections: Introduction, Key Areas, Delivery Methods, Evaluation Criteria, and Conclusion. Each section should be separated from the others by two newline characters, and only the sections should be divided in this manner, not the sentences inside a section. Each section can have 3-5 sentences and the sentences should only be separated by '.' and not by newline characters or spaces. Do not include the section names within the response and there should only be 5 paragraphs in the order of the sections listed here. Ensure that there are only 5 paragraphs in the response."

Along with the above prompts, the course information extracted earlier from the course's web page was sent to ChatGPT. The ChatGPT responses were then written directly into the script. This information was written according to the order of the video scene it belongs to (start scene, key topics and end scene). This way the user does not have to write the script manually.

### 3.4 Prompting DALL-E 2 to generate background images of the video

When creating any kind of video, visuals are as important as text and audio. In this experimental approach, we decided to use seven video scenes accompanied by five background images that are relevant to the text being narrated (the final scene uses the static university's logo). To accommodate them, the video script was edited suitably with placeholders for images. In this case, DALL-E 2 was selected to experiment with how visuals can be generated.

While ChatGPT could work with chunks of texts and paragraphs, the DALL-E 2 required textual descriptions less than 1000 words [10] and did not give promising results when the description was too long. To mitigate this, ChatGPT was prompted separately by our tool, to make five sentences describing suitable images. This information was then sent to DALL-E 2 through its API. For each sentence, two images were generated by DALL-E and all ten images per each sentence were exported to a separate folder in .png format, along with used descriptions(JSON) by the tool. Below is the prompt used in ChatGPT to generate the initial descriptions for DALL-E:

#### Intermediate prompt to generate background images by instructing DALL-E:

"A university teacher wants to find images for a course introductory video. Read these course descriptions and write a 1 matching sentence each describing 5 images that are suitable to be used in the video. Make sure the image descriptions do not describe real people and the educational environment. They should

also be artistic, and realistic, with no complex wording and simple enough to be understandable by image generation ai like DALL-E."

The generated images are expected to show different aspects of the course, according to the provided sentences. We manually picked the five most relevant images to be used as background graphics of the video and referenced them in the final video script, but in practice, this could have been also automatized.

### 3.5 Reviewing artefacts and generating the video using Narakeet

All the generated artefacts (video script, images) were then manually reviewed by the researchers to check if the facts were grammatically correct and unambiguous to appear in a video. Here, the researchers did not change the course information written by ChatGPT. If some of the sections were missing in the updated script or information written was ambiguous and not relevant to the course, we relaunched the process to get a newer version of the script written by ChatGPT. This step can probably be completely automatized with additional development. It should also be noted that the researchers did not engage in any prior conversations with the teachers of the respective courses to verify the correctness of the video content, to avoid any bias towards editing.

Next, five images out of the ten images were picked and then renamed as intro, key areas, delivery, teachers and conclusion to match with the sections in the video script. In practice, this step could also have been automatized since the images were quite abstract and had only decorative purposes.

After that, using Narakeet, the video was generated. In Narakeet, the generated video can be further improved to various narration styles, intro music etc. [9]. Our focus was to experiment with the capabilities of ChatGPT and DALL-E, therefore we did not experiment further with Narakeet at this point.

Figure 1 showcases video scenes of one such video that we finalized using our video generation tool and Narakeet software. The length of the video is 2:31 minutes.

### 3.6 Evaluation with a feedback survey

Next, we sent out the generated videos with a feedback survey to the respective teachers of the selected courses in the university. The courses were selected randomly based on the maximum amount of information available in the university's study guide.

The feedback survey included the following questions.

- (1) Age
- (2) Number of years of experience as a university teacher
- (3) Evaluate the content of the video as the responsible teacher of the course
- (4) General viewing experience of the video based on personal preferences
- (5) Any inaccuracies or missing information about the course
- (6) Likelihood to use similar videos as part of course arrangements
- (7) More Feedback

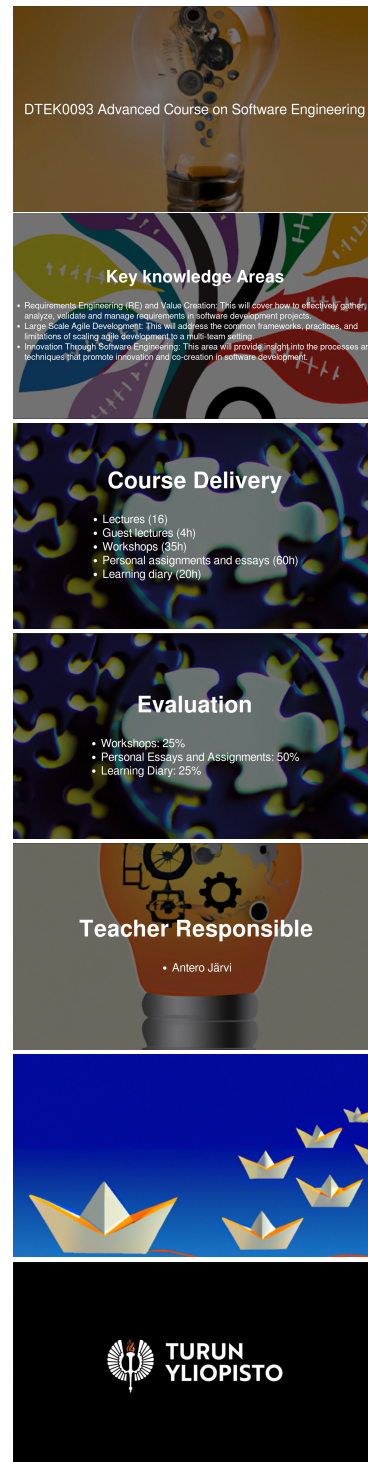


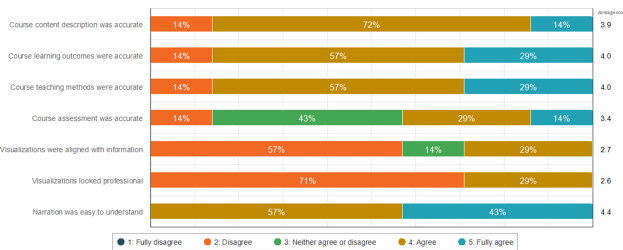
Figure 1: Seven captures(in order) of an AI generated course description video

**Table 1: Number of years of experience in teaching**

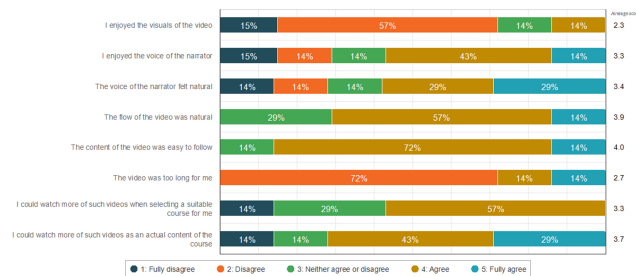
Experience	n	Percent
0-1 years	0	0,0%
2-5 years	1	14,3%
5-10 years	2	28,6%
10-20 years	1	14,3%
20- years	3	42,8%

## 4 RESULTS

We received the feedback from seven respondents and we analyzed the feedback anonymously. Table 1 shows the distribution of the respondents concerning their years of university teaching. Figure 2 and Figure 3 show how the respondents rated the content of the video and their personal viewing experience, respectively.



**Figure 2: Opinion accuracy of content as the responsible teacher of the course**



**Figure 3: Personal viewing experience of teachers**

According to Figure 2, ChatGPT was able to extract course content description, learning outcomes and teaching methods well. It had difficulties with the course assessment information probably because that information is defined quite briefly in the study guide. However, script generation was not completely accurate and some teachers had even severe issues with the course content text (description, learning outcomes, learning methods) generated by ChatGPT. Below are two responses made by teachers when we asked if they noticed any inaccurate content on the videos:

“Unfortunately, there were many inaccuracies. This is because the course is new and the content has been changing, but study coordinators did not wish

to change the OPAS and Peppi [study guide] pages. Inaccuracies appear in key knowledge areas, course delivery, and evaluation, The only correct slides were the first and last ones. I would also modify the spoken messages; they are not always correct. I would wish that the teachers were more involved in preparing this content.”

“In the spoken information, the delivery methods were described to be diverse and interactive, while the text on the screen stated just "Lectures". The correct information in the study guide would be "Lectures, project work and independent work". However, this video made me want to make the delivery methods more "diverse and interactive".”

Furthermore, according to Figure 2 and Figure 3, the visualizations and the professional appearance of videos need enhancement for better alignment and engagement. There were concerns about the visual elements not matching the quality and clarity of the narrative content. One teacher commented this as follows:

“I would say that the illustrations were not very well reflecting the content or the part that the video was explaining. At the end, there was a summary, but only in verbal form – a bullet list (or some other form) would have been useful to see.”

The images generated by DALL-E depended completely on course descriptions provided by ChatGPT. Therefore, the complexity of the prompts as well as the hallucination effect in ChatGPT could have affected the relevancy and meaningfulness of generated images. We also note that DALL-E 2 was the version available at the time of the experiment and its illustrations are generally weaker than those from DALL-E 3.

The teachers have observed the potential for these videos to support course selection by students, especially in study guides and Moodle pages. One teacher commented on this as follows:

“If the visuals could be improved, it would be great to have such links to such videos for all courses in the Study Guide or at least for elective courses and courses of minor studies to make it easier for the student to choose the courses.”

“I would not use the video in this form since it is too inaccurate. If this video is refined, I would post the link on public OPAS pages and use it in email advertising to potential students. Perhaps also the industry would be interested in hearing what we teach.”

On the other hand, the narrators’ voice quality and the natural flow of videos were appreciated, yet preferences varied among respondents according to Figure 3 and the below response:

“First of all, this was surprisingly good for having been generated with zero input from lecturers. The narration looked professional, and I liked the two voices, but the female voice was louder and clearer than the male one, so the alternation sounded strange. Some images were not too well related to the course topic and they were quite dark - lighter colours would be more positive. In the future, images from classes could

be arranged and used, our teaching assistants can take the images. On one screen (teacher responsible) there was only 1 bullet point - that looks strange and could be removed. The capitalization could also be made more uniform. Some text was so wide it left no margin space - formatting could be better. The pace was good, but I thought the 2min was overly long for the amount of content.”

The use of Generative AI tools ChatGPT and DALL-E for generating course introduction videos was generally well-received by university teaching staff. However, teachers emphasize the importance of reviewing the accuracy and overall clarity of the generated educational materials among other feedback.

## 5 DISCUSSION & FUTURE WORK

At the experimentation stage of the video generation tool, we fed the model with a limited amount of information and, as a result, it did not generate good enough responses. Due to this, for the study, we picked courses that had a relatively high amount of information published in the university’s study guide. The ChatGPT completely relied on that information when generating the video script. For ChatGPT to generate a meaningful script, the extracted information would have been not enough in some courses. Further, teachers have also mentioned, that their course pages are not always up-to-date. Therefore it can be said that the quality of the ChatGPT-generated scripts is highly dependent on the quality as well as quantity of course information available in the study guide.

Furthermore, ChatGPT might give wrong or misleading answers and can hallucinate as it is only a language model that cannot think or feel [8]. Therefore, manually reviewing content generated by ChatGPT is essential to address the inaccuracies in the content caused by such limitations. In this study, we edited grammatical errors in the generated text. We did not employ respective teachers to review the accuracy of the content as we determined to explore the unbiased view of teachers on the AI-generated videos. In future, it is essential to facilitate teacher’s review of video content during the video generation process.

Another observation from the feedback survey was that generated narration was more abstract than bullet lists and other course texts shown in the video. The script (narration text and bullet lists in the video) resulted from the two API calls with two different prompts analyzing the same course description derived from the study guide. On the other hand, while we cannot eliminate the hallucination situation of the ChatGPT as a language model, it can be reduced by sending enough information explaining the context of the task along with the prompt [17]. All-in-all, these observations invite further research on prompt engineering, which is about optimizing the user prompts given to ChatGPT that will maximize the outcome.

There was also an interest in using these AI-generated videos to increase the engagement of students in the study guide and Moodle environment. It is also possible to develop this workflow to automate the process of video creation for actual course topics. This further invites us to investigate the scalability of producing AI-generated videos for a wide range of courses and assess the effectiveness it brings to existing pedagogical practices.

Lastly, it should be noted that using the above workflow, videos were initially generated for courses that were taught in English as well as in Finnish languages. However, we only disseminated videos of courses taught in English in our feedback survey to teachers. This is because we noticed in certain situations, ChatGPT used both languages while generating the video scripts of the Finnish courses, therefore needed further review of the content.

## 6 CONCLUSION

This research aimed to introduce a video generation workflow that works as autonomously as possible using ChatGPT, DALL-E and Narakeet. In this paper, we showed that the workflow is feasible by creating a working tool that mostly automates the workflow. The tool allowed us to quickly generate introduction videos for the University of Turku courses without direct support from the corresponding teachers.

We also conducted a survey where the responsible teachers were able to give feedback on the generated videos of their courses. The results were promising although they also showed the need to manually review the generated videos due to the limitations in the GPT technology and the deficiencies in the original study guide texts.

Based on the results of the study, it is evident that combining the capabilities of generative AI tools can fast-track the existing pedagogical practises. We believe that teachers can use this workflow by themselves with a minimum technical knowledge of AI. In general, this workflow could help anyone, not just teachers, to build videos efficiently, and with reduced cost. We believe our video generation workflow presents a novel way of doing so and opens paths for similar integrations with generative AI tools.

In the future, we plan to further study the use of the current tool with a greater number of courses. We will also expand the functionality of our tool to experiment with generating actual lecture videos based on the lecture notes and other existing textual study materials of selected university courses.

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