

事例報告

Implementation of a Video-lecture for a Flipped Classroom Transition at ICT

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Education paradigms such as flipped classrooms are becoming increasingly popular as an effective method to actively engage students in learning course content. At International College of Technology, Kanazawa (ICT), there is a need for an education system that satisfies the needs of students with various backgrounds, skills, and thinking methodologies. Flipped classrooms, as one of the educational paradigms being explored, allows students to study content at their own pace outside of class with more direct guidance during class. However, for students to study effectively, a pre-prepared lecture, in the form of a video, is vital. This case report aims to explore the effectiveness and requirements of a method of video creation for flipped classroom transition.

Keywords: Flipped classroom, video creation

1. Introduction

1.1 Explanation of a Flipped Classroom

Education paradigms have shifted in recent times from traditional teacher-centered lectures to incorporate more student-centered approaches. One of these is the flipped classroom, where the introduction of knowledge occurs outside of the classroom through the use of technology such as video creation software, learning management software, and interactive simulations. The in-class time is then opened up to be used on guided interactions into the applications of that knowledge through discussions, exercises, and other hands-on activities. This allows students to learn the course content at their own pace while learning how to apply that knowledge under guided instruction. This contrasts with the traditional classroom where students learn course content under guided instruction and attempt to apply it outside of class. It is widely considered as an effective student-oriented method of learning.¹⁾

However, the successful implementation of the flipped classroom is determined by the handling of several technical and pedagogical hurdles. The flipped classroom approach requires the specific use of modern software and technology. In the case of a video lecture, a poor-quality video can have a negative effect on the students' learning and as such, the teacher needs to have a sufficient enough working knowledge of video creation software, technology, and methodology to create a high-quality video.²⁾

1.2 Explanation of ICT background

This research took place at International College of Technology, Kanazawa (ICT), an engineering KOSEN school in Kanazawa, Japan. Within the backdrop of a school curriculum shift in 2018, the student body shifted from being nearly entirely composed of local Kanazawa students to being composed of students with educational backgrounds from all over Japan as well as from foreign countries. As such, the skill level and experiences of the students in regards to language, knowledge, classroom style, and thinking methodologies vastly differ in both quantity and quality. As such, there is a need to shift away from traditional lectures and focus on developing each student based on their needs. The implementation of a flipped classroom where students can learn the content at their own pace while in-class time is redirected towards individual instruction is one considered solution.

2. Format of Flipped Classroom style to be implemented

2.1 Class format

The author implemented a version of a flipped classroom in his 2025 academic year Applied Physics II class. Every topic in the course consisted of a lecture followed by an exercise, with the entire course consisting of six main topics. The first two topics were implemented in a traditional in-class lecture format, where the majority of in-class time was composed of a PowerPoint slide presentation. Any remaining time was delegated to working on example problems, which extended into homework assignments after the class. The remaining four topics were conducted in a flipped classroom format.

In an effort to prevent the introduction of too many variables, the only change to the class for the flipped classroom topics was to move the lecture portion to a video format meant to be watched as a pre-class assignment. In its place, all of the in-class time was delegated to example problems and the early start of homework assignments, focusing comparatively more time on direct instruction for each student as they work to apply their understanding of the concepts from the video. As such, this paper will only focus on the transition of the lecture from in-class to pre-class. The in-class portion of the course remained the same.

2.2 Video format

The recorded video was constructed with the following considerations: 1) minimal editing and simple setups to reduce technical knowledge overhead, 2) simple computer accessories and software to reduce cost, 3) the personal inclusion of the teacher to engage the listener. To reduce the editing required, the video was split into only two distinct parts: the direct lecture and one worked-out example problem. Each section was recorded in one continuous take using the free and open source OBS Studio software, and both videos were then spliced into one using the free video editing software, Microsoft Clipchamp.

The lecture part was conducted using a previously prepared PowerPoint slide presentation and the software's laser point feature during the presentation mode. In one corner of the screen, the teacher's visage is captured and inserted with a business webcam. The background was removed with a green screen and OBS's color filter in order to minimize interference with the content of the

slides.

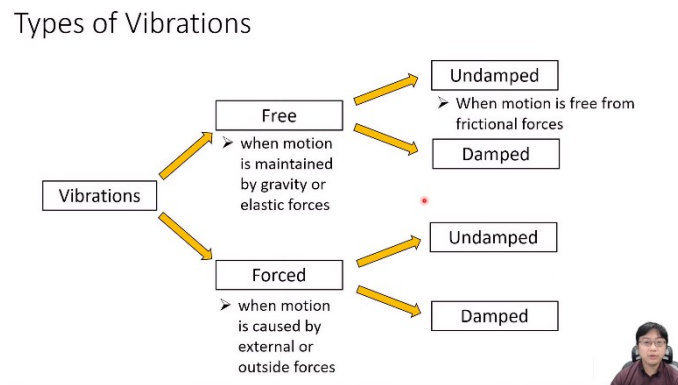


Fig. 1 Lecture Section Setup

The example problem section of the video was set up with the text of the example problem in one corner and the teacher's visage in another corner. The rest of the screen consisted of a screen capture of an iPad connected to the main PC. By using the iPad's touchscreen, a touch pen, and a notepad application, the teacher is able to directly demonstrate by hand the method to solve the problem on the screen.

The audio of the teacher's lecture throughout the video was captured using the built-in microphone from the webcam. No software modifications or processing were performed on the input audio. However, care was taken to minimize background noise during recording.

Example 1

The damping factor $\frac{c}{2m}$ may be determined experimentally by measuring the successive amplitudes of vibrating motion of a system. If two of these maximum displacements can be approximated by x_1 and x_2 , show that $\ln\left(\frac{x_1}{x_2}\right) = \frac{2\pi}{\omega_d} \frac{c}{2m}$. The quantity $\ln\left(\frac{x_1}{x_2}\right)$ is called the logarithmic decrement.

$$x_1 = D e^{-\frac{c}{2m} t_1}$$

$$x_2 = D e^{-\frac{c}{2m} t_2}$$

$$\frac{x_1}{x_2} = \frac{D e^{-\frac{c}{2m} t_1}}{D e^{-\frac{c}{2m} t_2}} = e^{-\frac{c}{2m} (t_1 - t_2)}$$

$$T_0 = t_2 - t_1 = \frac{2\pi}{\omega_0}$$

$$\frac{x_1}{x_2} = e^{-\frac{c}{2m} \left(\frac{2\pi}{\omega_0}\right)}$$

$$\ln\left(\frac{x_1}{x_2}\right) = \ln\left(e^{-\frac{c}{2m} \left(\frac{2\pi}{\omega_0}\right)}\right)$$

Fig. 2 Example Section Setup

3. Student Response and Analysis

The course in which this flipped classroom style was implemented consisted of three students. Due to the small sample size, the students were solely surveyed qualitatively about their reception of the videos but in two different ways. First, throughout the weeks of the course conducted as a flipped classroom, the students were asked to detail their immediate reactions to the structure of the video and the difference in the class format. At this point, students were not specifically prompted to comment about any specific aspect of the video in order to prevent a biased perception of future videos. If they did not influence the original considerations, these comments

were acted on immediately to improve the quality of the next video. Second, the students were surveyed at the end of the course. In this survey, the students were prompted to compare the effectiveness of the implemented format to other formats and explain their comments.

The initial responses from the students were positive with one student reflecting the notion that there would be more time for in-class practice and another commenting that the videos were still understandable at 1.5x speed. However, there were also points for improvement. Several students commented about the format of the example problem section, in particular with how the written solution was not displayed well because the problem text took up too much screen space or part of the solution was moved offscreen to make room for further calculations.

In the final survey, students were asked to reflect on their overall experience with the simplified flipped classroom regarding their engagement with the style and their thoughts on the video format. Students were asked to express their thoughts in response to the following questions.

- To what extent do you think the flipped classroom model enabled you to reach a better understanding of the content than a regular lecture style class would?
- To what extent was the lecture being in the format of a pre-recorded video useful in helping you follow the content?
- How effective was the use of the PowerPoint slides (compared to a camera recording in a classroom) in the video to your learning?
- How effective was the visual (the webcam feed) of the teacher's face in the video to your learning or sense of engagement with the lecture?
- In regards to the example problem demonstrated in handwritten format, compared to a digital font format where every equation is typed, how effective was the handwritten format to your learning or engagement?
- What is the maximum amount of time that you think a video should be before they become "too long"?
- To what extent did the quality of the audio affect your learning or engagement with the lecture?

Overall, two students did not particularly feel that the flipped classroom caused any noticeable difference in their understanding of the class contents compared to a traditional lecture although one student did express a slight positive impression, noting they can "work on more example problems and ask for help if he got stuck," seemingly echoing the concept of the flipped classroom format. This could be due to the short duration or the simplicity of the implemented flipped classroom. Further research will need to focus on ensuring a comparatively different experience. However, this also indicates that students can find it easier to adapt to the different style.

On the other hand, the students found the video format useful, noting that they can "rewatch parts of the video" and "prepare questions to ask immediately at the beginning of class". For students who face a language barrier, this can allow them more time to study and review the content, allowing them easier access to in-class activities.

Regarding the PowerPoint slides in comparison to a video recording of an in-class lecture,

the students noted that slides were “always useful” and “100% easier to see.” While the direct effectiveness of PowerPoint slides is difficult to conclude from these responses, it can be concluded that students prefer visual materials adapted to be viewed in the video format.

However, the webcam feed of the teacher was met with neutral views, with no noticeable influence to their engagement with the video as it was “never in the way.” Further research will require the comparison of videos with and without the visual.

The handwritten example problem was met with varying responses ranging from neutral to very positive. One student expressed indifference, another student expressed a slight positive impression, and the third student considered the format effective to their learning. With an overall positive average, it can be seen that a handwritten example was impactful.

The length of the videos ranged from 30-45 minutes. Student responses regarding an appropriate length for the videos considered less than 30 minutes to be an appropriate length. As such, longer lectures could necessitate being divided into shorter sections. Further research will explore the optimal length of lecture videos for ICT students.

All of the students expressed that the quality of the audio from the webcam did not cause any significant or noticeable effect on their understanding of the video. Based on this, a simple webcam can be sufficient to minimize any negative impact on the students’ engagement with the video. However, future research can focus on whether improving the quality of the audio can result in more positive influences in the students’ engagement.

4. Limitations and recommendations

The flipped classroom style detailed in this paper can be determined to be an effective method of student-oriented learning. However, there are several technical, pedagogical, and logistical impediments that prevent this style of learning from being easily implemented.

From a technical standpoint, although not advanced, a certain level of computer knowledge and experience is needed to use OBS and the video editing software to splice together multiple screen captures into a coherent lecture video. All of the software had to be set up so that the operation of the PowerPoint with the implementation of the lecture during the recording is smooth.

From a pedagogical standpoint, due to the visage captured in one corner of the screen, there is a need to conduct the lecture from the perspective of an image on the screen talking to the student. This requires the constant understanding that it is necessary to look at the camera instead of the slides when speaking to create the illusion of eye contact.

Understanding and overcoming the technical and pedagogical impediments is encompassed within logistics. Of the four videos, three averaged around 30 minutes while one averaged 45 minutes. Omitting the content and slide preparation, the time spent setting the software and hardware, recording the two sections of the video, and minimal editing averaged 3-4 hours per video. Of course, with experience, this amount of preparation time can be reduced, and the videos can be reused in future academic years. However, the initial investment remains a large impediment that requires a significant time commitment.

5. Conclusion

The flipped classroom style is a method of active learning that allows students to obtain the initial knowledge of a topic at their own pace while allowing for more direct guidance in the application of that knowledge compared to traditional lecture-based classrooms. The video lectures are available for students to watch and rewatch at their own discretion. However, the initial implementation and creation of the video requires a significant time commitment towards understanding the hardware and software involved while adapting to a new style of lecture.

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