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Flipped learning in a large classroom

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Introduction

A large classroom teaching ($n \geq 30$) is often found in the university set-
ting targeting a large body of students. Because of the class size, the lecture
is often monologue, has a lack of interactions with students, and is diffi-
cult to give and receive feedback between students and teachers. Moreover,
teachers often experience a lack of time to deliver knowledge and observe
passive participation of the student in the classroom. To solve these prob-
lems, Mazur proposed flipped learning, which transfers the knowledge be-
fore the class so that the class time is used to help students assimilate what
they learn prior to the class (Farmer, 2018; Mazur & Hilborn, 1997). In this
project, I aimed to experiment the flipped learning focusing on two things:
how to deliver knowledge in a given time and how to motivate students,
not because of external regulation (e.g., exam or grade), but because of be-
ing internally motivated and interested in participating in the class (Ryan &
Deci, 2000).

   The experiment was conducted in the 'Register-Based Epidemiology'
class (University of Copenhagen, 2021b) with 42 students: 23 MSc students
in the Business Administration and Innovation in Health Care, Copenhagen
Business School (CBS), and 19 MSc students in Health Informatics, Uni-
versity of Copenhagen (KU). The class was held in Block 4 in 2021 for 10
weeks, 2 days/week, 4 hours/day. The course aimed to learn epidemiology
using Denmark's register data, and estimate epidemiological measures such
as incidence rate and incidence rate ratio of certain diseases using statistical
software, STATA (University of Copenhagen, 2021b). The class coordinato

taught Epidemiology, and I taught Statistics and ran hands-on exercises. The experiment of flipped learning was applied to the hands-on exercises.

The project report described the process of the flipped learning class-room, including preparation, experiment, and evaluation.

Preparation

Before the class started, I had a pre-observation meeting to prepare for the experiment with my two supervisors. At the meeting, we planed the flipped learning class that would make students actively be involved in the class, including pre-class and classroom activities.

At the pre-observation meeting, we discussed logistics and practical issues in the flipped learning class. First, we concluded that I uploaded two 5-min pre-recorded lecture videos that students were supposed to watch before they came to the class. We also planned to make students reflect on the video by asking questions to peers in the quiz format. The two supervisors also gave tips regarding the quizzes, such as taking turns to list the quizzes by two different groups (e.g., KU on Tuesday and CBS on Thursday). These questions could be answered or discussed by the rest of the students in the classroom.

We discussed how to help students assimilate what they have watched in the pre-recorded videos. We concluded that I could assign group activities with different topics (e.g., various diseases and subgroups) related to the pre-recorded lecture videos and ask students to present the group work or give feedback to other groups. I also planned how to group the students, how many in a group, how to motivate students to work on the topic in the group. In terms of grouping, the two supervisors suggested a few options for formulating groups, including randomly assigned groups, close-distance groups, or student-made groups. They suggested trying one of them and seeing which one works better than the other ones. We concluded that 4-5 students in a group are ideal for the group discussion, and the group activities must be in the same format but different diseases or subgroups. Finally, I planned to ask students to present their group activities to other groups to have a peer review or discuss any problems or issues.

At the pre-observation meeting, the supervisors emphasized that I need to inform students on the formulation of and expectations from the experiment, learning objectives, and course descriptions. They also suggested

collecting students' evaluations of what works and what to improve after a couple of classes.

Experiment: Flipped learning classroom

From day one to the end of the class, I reminded my intention on flipped learning and my and their expectations from the flipped learning and the intended learning outcomes. I formulated a two-hour flipped learning class, including watching pre-recorded videos and listing quizzes prior to class, 15-min discussion of students' quizzes, 20-min group activities, 20-min student presentation, 15-min evaluation or discussion of the group activities, and 15-min for wrap up or supplementary lecture if needed.

Prior to the class, I uploaded pre-recorded lecture videos. The video lasted 5 or 10 minutes and contained essential information on the content. I used Zoom to record the lecture while I shared the PowerPoint or STATA screen. As I was not proficient in a video editor, I tried to make the video without any edits, which means that I had to try many times to make a final version. Sometimes, I spent two hours making a 5-min video and regretted that I did not try with a video editor. I also tried to make videos short (5 or 10-min) as most Youtube videos lasted less than 10 min and I believed that concentration span time is shorter than 10 min, too. However, if the content is complicated, I made two 10 or 15-min videos. In the video, I tried not to lecture the entire content but to deliver essential knowledge on the topic and motivate students for their hands-on exercises. If they did not watch the videos, they could not follow the group exercises. So I emphasized that it was crucial to watch the lecture videos before they came to the class.

Second, I asked students to list two quizzes for peers, and I used them as topics to discuss in the class for 15 min. The quizzes must be related to the pre-recorded videos. When the students did not bother to list the quizzes, I had few topics to discuss. However, I did not go beyond those quizzes in the discussion because I meant to give the impression that the class was run by the student's participation, not by me. After a few sessions, 3 or 4 students listed a couple of quizzes at every session, which was just enough for 15 min discussion. I first let students talk to their neighbors for a few min about the solutions or answers and then walked around asking for any volunteers to answer them or pointing to a couple of students for the answers. If necessary, I reviewed the slides from the previous classes or pre-recorded lectures to remind students of the content.

Third, students had group activities in the class. I listed the topics for the group activities prior to the class, assigned each topic to a group, and gave 20 min for the group exercise. The topics were slightly different by groups, such as different subgroups or diseases. For example, when I asked students to calculate the mortality rate ratio, I listed several causes of death (e.g., suicide, lung cancer, or ischemic heart disease). After the group work, students presented their results. As STATA programming was a part of the group activities, I provided sample STATA codes for their exercise with an example disease or subgroup and asked students to assimilate the example codes. As we have a 5-hour exam, I also encouraged them to be ready for the exam by practicing the exercise and making their own codes that they can use in the exam. Even though they did not finish the group activity, we still discussed their works, including their plans for the analysis and any issues in coding or the content. In this presentation, I was able to see how much they understood the content and assimilated the lecture videos or template codes. Some students understood the topic easily and exceeded the intended learning objectives in the class. In contrast, other students needed more time to understand the content and used the presentation time as a part of the learning process by asking questions. I also made myself and two teaching assistants available to answer questions and help the groups during the group activities.

Fourth, I made additional step-by-step videos for individual exercises and uploaded them at the beginning of the semester. The individual exercise questions had 10 sub-questions, and every step was recorded in the video. These videos were made in 2019 and reused every year as the class evaluation from students of the last two years highly appreciated the exercise videos. Although the contents of individual and group exercises were very similar, and these individual exercise videos could help students prepare for the class or the group exercise, I realized that students did not use them this year as much as the last two years. I assumed that students focused more on group activities in class rather than individual exercises outside the classroom.

Fifth, I wrapped up the class by taking questions from the students. Sometimes they asked me to make more videos for certain topics, which I happily created additional ones for them. As different groups had different topics, one of the students asked whether they could have a list of solutions for all group exercises. But I asked the student to initiate the work for peers and list all group activities in the google doc. By the end of the semester, I

checked the google doc and found that the students filled solutions for all group activities.

Sixth, although I intended to give aggregated (or internal) motivation to students, students still showed their interest in the exam or grades (a.k.a. external motivation). This year, the exam was 99.9% identical to some of the group activities that students did in this flipped learning class. As their group activities met the intended learning objectives, and we spent most of the time for the group activities in the class, I anticipated that students could achieve their goals in class.

Finally, I asked for students' final evaluation at the last class of the course in addition to frequent feedback after each class. In this evaluation, I used open-ended questions by asking three questions specifically for the flipped learning classroom, neither other lecturer's part nor overall course. The survey was conducted using SurveyXact, including three questions: 'Can you describe what you liked most about the flipped learning classroom?', 'Can you describe what part I can improve in the flipped learning classroom?', and 'Please leave any other feedback.' Some of the students participated in the final evaluation and gave a thorough review of this experiment.

Discussion

I applied the flipped learning classroom to solve two main problems: lack of time to transfer knowledge and motivate students. I planned the class with two supervisors and conducted the experiment for 10 weeks in 2021. I intended to deliver the knowledge prior to class and help students assimilate what they learned from the pre-recorded lectures. Compared to non-flipped learning, it took more time to prepare the class, such as pre-recorded lecture videos. However, I was satisfied that I delivered the knowledge in a given time because I had enough trials and errors while making the lecture videos. The quantitative student participation rate was improved. In 2019 and 2020, 60 and 80 students, respectively, enrolled the course, but only less than 30% of enrolled students participated in the classes. In 2021, 42 students enrolled in the course, and more than 60% participated in most classes. Although there were other factors for the participation rate (e.g., pandemic and infection spread rate), I observed differences in students' activities in the flipped learning class from the non-flipped class. When they were assigned by different topics, most of the students managed to make

the groups immediately and discussed actively, and asked questions to me and teaching assistants when they had any difficulties. When they presented their group activities, they were not perfect but tried to learn. Whenever I saw any common mistakes in the analyses during the presentation, I pointed out the mistakes and discussed the solutions with the presenters or their group members.

Students' evaluation indicated that they got benefits from pre-recorded videos and template STATA codes for the hands-on exercises and questions that came up from other groups during the discussion time. However, some students lost the track of the class if they could not come to the classroom and felt uncomfortable with being pointed out during the discussion.

I also experienced some difficulties in the class, including time for preparation, discussion pressure, and a lack of ways to catch up.

First, recording the lecture videos took so much time. In the first few weeks, I had to spend at least 4 hours per week just recording the videos, and I sometimes was worn out by this one-man show: I was an actor, a director, and a camera director. I thought about writing scripts in addition to making slides and writing STATA codes. However, reading scripts was not easy on both screens (Powerpoint and STATA). As I repeated the recording, I finished it quicker than the beginning. Next year, I can reuse the lecture videos, so it was a good investment.

Second, some students felt uncomfortable with discussions in the class. I often led the discussion by asking some questions, and sometimes the discussion was involved with pointing a certain student. For example, when a student asked me a question, I normally asked back to students to give a clue. Then the conversation was on and on until the student got her or his answers. In this conversation, I must have put some pressure on the student to draw her or his thoughts. Although I enjoyed the type of discussion, some students felt uncomfortable in the discussion. One student from the course noted in the evaluation, 'the atmosphere you created in the class could be a bit more at ease, less fast, and less stressful and more supportive (e.g., instead of putting extra pressure on people, ensuring them verbally from the beginning that it will be tough but ok).' To eliminate the stress, I may need to consider different strategies for the discussion, such as a pair discussion only unless they have common issues.

Third, I started the class by explaining my intention and expectation from the students. However, if the students did not come to the class, they were easily lost in the next class. Several KU students told me that they had a schedule conflict and would catch up with lecture videos or slides.

However, as one student from the final evaluation noted, 'If one misses a class s/he gets really behind', it was hard to follow the lecture if they were not able to be present in the class. Next year, I should not allow any excuses such as the schedule conflict. Not only the schedule, but students also could not make the class physically due to illness such as COVID-19 infection, and were allowed to join the zoom meeting after all. However, I did not prepare for hybrid class group activities. I would better explore other tools.

There were also some other minor issues. The current auditorium classroom was not set ideally for group discussions as students had difficulty sharing their computer screens in the group. Some Mac computers did not have HDMI connections, so students could not present their group works with their own computers. However, these are technical issues and can be resolved easily for the class, reserving another classroom for the group activities and preparing HDMI connections for various devices.

Next year, I can have the flipped learning classroom with a modified discussion format and hybrid group activities. As students often feel uncomfortable to be pointed out, I can have a voting system (e.g., Sendsteps) right after the discussion among pairs or neighbors. When the voting results are far away from the correct answers, I can discuss with students who might see themselves deviating from the rest of the group; otherwise, I can move on to the next question (Lambert et al., 2012). For the hybrid group activities, in addition to the Zoom group room, I can also try with other platforms such as the Google classroom, Gather, or PebblePad. With the modified formulation of the course, I can motivate students in a learning-oriented way and lead students to obtain the knowledge for exploring and analyzing the register data (University of Copenhagen, 2021a).

Finally, I discussed the reflection on the project with one of the supervisors. He agreed that some of the challenges (e.g., discussion pressure) could not be avoided for some students but were necessary to motivate students in the class.

I initiated a new teaching format, flipped learning, by making prerecorded videos and organizing group activities and discussions in the class. I believe that this practice-oriented project improved my pedagogical competence. In this flipped learning class, I set out clear learning goals and organized the teaching and group activities accordingly. I also acknowledged the students' learning needs and challenges through discussions and quizzes, gave the students feedback on their learning through students' presentations, and designed the exam to reflect the students' work with the learning objectives.

References

Farmer, R. (2018). The what, the how and the why of the flipped classroom. *Innovative Practice in Higher Education*, *3*(2).

Lambert, C., Mazur, E., & Hilborn, R. (2012). Twilight of the lecture. *Harvard Magazine*. http://harvardmagazine.com/2012/03/twilight-of-the-lecture

Mazur, E., & Hilborn, R. (1997). Peer instruction: A user's manual. *Physics Today*, *50*(4), 68.

Ryan, R., & Deci, E. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67. https://doi.org/https://doi.org/10.1006/ceps.1999.1020

University of Copenhagen. (2021a). *Learning, motivation and context*. Absalon. https://absalon.ku.dk/courses/48238/files/4441695?module_item_id=1186224

University of Copenhagen. (2021b). Sitk20001u course in register based epidemiology [Retrieved December 17]. https://kurser.ku.dk/course/sitk20001u/2021-2022