Flipped classroom in higher Norwegian IT education

Lauvås, Per
Westerdals - Oslo School of Art, Communication and Technology
Institute of Technology

Styve, Arne
NTNU Ålesund
Faculty of Information Technology and Electrical Engineering (IE)
/Department of ICT and Natural Sciences

Abstract

In recent years, Flipped Classroom has been a well described approach to organizing a learning environment. The approach is, and has been, in use at many levels of educational systems in many parts of the world and within different subject areas. In this study, we narrow the scope and focus on the use of Flipped Classroom within higher Information Technology (IT) education in Norway. We want to investigate if Flipped Classroom is in use, and if so, to what degree? What are the stories from educators who have tried Flipped Classroom when teaching IT related courses in higher education?

Through semi structured interviews we want to investigate the motivation behind choosing this pedagogical method, and the results of course deliveries in a Flipped Classroom setting.

The findings suggest that the use of Flipped Classroom in higher Norwegian IT education is limited. The experiences of using the approach, conveyed through the interviews, are positive. Most students are satisfied. The teacher is happy. The academic results are as good or even better than those achieved prior to flipping the classroom. So why is the use of Flipped Classroom limited when the results are good? The interviewees have their opinions on that question also.

The study provides a look into the current status of Flipped Classroom usage in the higher Norwegian IT education. It also provides good tips to those who are planning to flip the classroom for the first time.

1 Introduction

The term Flipped Classroom (FC) has been around for a few years now, and it seems that many educators within higher education are either doing FC or in a process of

This paper was presented at the NIK-2017 conference; see http://www.nik.no/.

considering to change their teaching methods into some sort of FC form. Multiple definitions of FC (or inverted classroom) exist. Lage, et al. [6, p.32] describes it as:

> '*Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa.'*

Both authors are teaching courses within information technology to fairly large classes (100 - 250 students), and both are considering using FC in the near future.

Our motivation for this work is based on the desire to provide a better learning environment for our students by using modern technology in combination with new teaching methods. Through this survey, we wanted to learn from the experiences of lecturers that have used, and are using FC in their teaching, hoping to identify the typical pitfalls and challenges related to FC.

The purpose of this paper is to get an overview of the use of FC among information technology courses in higher education in Norway. And we hope this study can provide some useful insights to anyone considering FC for the first time.

2 Background

The idea of using FC in a learning environment is far from new. In recent years we find much research regarding FC in all levels of education. Bishop and Verleger [1] provides a comprehensive survey of research conducted until then. Although methods and findings within the 24 studies differed, the general perception of the students were found to be relatively consistent. The students tended to be positive, with a few students strongly disliking the approach. The students did prepare for class, and when preparing, they preferred video resources over text. The performance of the students improved in a FC setting, although shortcomings of these results were highlighted.

The instrument types used in these studies were *Subjective Opinion Survey or Informal Assessment* and *Objective Performance Test* where the former was most common. So, the studies were focusing on student perception of a course delivery in a FC setting, and an objective evaluation of the student outcome in these courses.

Two years later, O'Flaherty and Phillips [9] did a scoping review of the use of FC in higher education. They identified multiple research questions, where four of these were:

1. What technologies are being used to engage students in a flipped class?
2. What considerations are there pertaining to the economic and time constraints required to implement a flipped class?
3. What is known about the pedagogical acceptance by both staff and students?
4. What are the educational outcomes arising from a flipped class?

They found a large variety of resources in use, when students prepare for class like podcasts, vodcasts, screencasts, annotated notes, captured videos, prereadings, automated tutoring systems and study guides, interactive videos from an online repositories, case-based presentations and simulations. They also

found large varieties of activities in use in-class: case-based presentations, team-based discussions, panel discussions, expert led discussions, role-plays and student presentations, discussions and debates.

There is a substantial cost of flipping the classroom when the flipping involves producing a lot of new resources. Some institutions are developing a supporting staff to help with this work. But the majority of studies focused on the use of pre-existing resources found online. And by doing so, the initial cost of flipping is drastically reduced.

Although some studies within the review report of students critical to the fact that they had to take more responsibility for their own learning, the majority of studies report students who adapt well with flipped class. The latter studies suggest introducing FC to students early in their studies. But there was no evidence to support if FC is best introduced in the first, second, third or forth year.

A majority of the studies described the students perception of flipping the class, and fewer described the opinion from the staff point of view. But in the studies which did, the perceptions of staff in relation to acceptance of flipped class, were on the whole, positive. At least when the needed support was in place. There were no reported differences in the short term outcomes to suggest a smaller cohort of students ($<$150) performed differently to a larger flipped class.

A large number of articles in the review report improved student satisfaction, improved academic outcome and increased attendance. But very few articles used a robust scientific approach to evaluate educational outcomes, especially when educational outcome is viewed as more than exam results.

Giannakos and Krogstie [4] provided a review of the FC approach in order to summarize findings, guide future studies, and reflect major achievements in the area of Computer Science (CS) education. In 32 peer-reviewed articles, they investigated the sample size, subject area, type of research, technology used to flip, measures used and a summary of benefits and challenges.

The vast majority of studies involved undergraduate students. The sample size was in most cases less than 100 students. CS/IT studies were well represented as nearly half the studies involved CS/IT subject areas. The majorities of the studies followed a quantitative or mixed methodology approach with only two studies being totally qualitative. Most of the studies investigated used video lectures as preparation for class. And most of the studies used attitudinal and learning performance measures.

Six key benefits were found: *Increases Learning Performance*, *Positive Attitudes*, *Increases Engagement*, *More Discussions*, *Enforces Cooperative Learning* and *Better learning habits*.

And they found three key challenges: *High initial cost and very time consuming for the instructor*, *Students unreceptive with the Structure* and *Decrease of Attendance*.

A recent study regarding FC in higher education in Norway is Foldnes [3]. Foldnes studied final exam scores in a FC setting relative to exam results in a traditional lecture based delivery. He found that flipping the classroom in itself did not give statistically significant better results. But when cooperative learning activities were introduced in the in-class FC, the students performed significantly better.

3 Method

In this study we wanted to narrow the scope and focus on FC in Norwegian higher IT education. We wanted to talk to educators within this scope who had experienced using FC in their teaching profession. It is not easy to draw a specific line separating IT studies from non-IT studies. At the online site studiebarometeret.no, all studies within Norwegian higher education are described. When a user (i.e. a prospective student looking for study options) wants to find specific studies within a field of interest, she may use categories to limit the search. We used the categories found at Studiebarometeret as a starting point when looking for our educators. The following categories where used: *Bachelor*, *Master*, *Full time*, *Natural sciences, vocational and technical subjects->Information and computer technology.*

These search criteria resulted in 94 study programs in twelve educational institutions (in order of appearance): UiT The Arctic University of Norway, Norwegian University of Science and Technology, Bergen University College, University of Bergen, University of Agder, University of Stavanger, University of Oslo, Westerdals Oslo School of Arts, Communication and Technology, Oslo and Akershus University College of Applied Sciences, Østfold University College, University College of Southeast Norway and finally Nord University.

We used a mix of our academic networks and online contact information to find persons within these organizations who could guide us to educators who had experience using FC when teaching an IT related subject. There was no intention of finding every educator with FC experience. We wanted enough interview candidates to get started, and we wanted candidates form a variety of educational institutions in Norway. Later we decided to include two educators with FC experience, although the courses involved where not within the field of IT.

It was fairly easy to find candidates, and when they were found they were all positive to share their stories on their experiences. We decided to do a survey based on semi-structured interviews [8, Chapter 13]. Prior to each interview we sent a consent form to each participant. This explained that all data would be handled anonymously. It further described the purpose of the research project and how data from the interview would be stored and later deleted. It also explained the purpose of the use of an audio recorder in the interview.

The interviews were held totally or partly over Skype. For most of the interviews, two interviewers and one interviewee where present in the meeting, but not all of them in person. When the interviewee was located geographically close to one of the researchers, the interview was conducted with one researcher and one educator in a physical room with the second researcher participating through Skype. When the educator was not geographically close, all participants used Skype.

One researcher was the most active part in the interview, and the other one took notes. The one taking notes could, and did, participate in the conversation at any time in the interview. The notes were the starting point for a transcription of the interviews. For all interviews, the notes were complemented with richer content through an editing process while listening through the playback of the interview. After the transcription process, the transcribed interviews were sent back to the interviewees for approval. In one of the interviews the sound file was corrupt, so the initial notes from the interview could not be complemented with data from a recording. The data from this interview was considered rich enough to still be a part of the collected data material.

A total of twelve interviews were conducted. These twelve educators came from seven of the institutions described above as within our scope. When all interviews were approved, we categorized our findings by looking for similar topics being covered in the different interviews. All quotes have been approved specifically.

4 Findings

The following questions were found to be evolving through our interviews:

- Where or how did you learn about FC, and what was the motivation for introducing FC in your teaching?
- What type of resources/material are made available for the students to be used in preparation to the class? How much can you reuse from one year to the next?
- How are the students working in class?
- Do the students prepare? What about the students that do not prepare before the class?
- Does FC work for all students, and all types of subjects?
- Is FC widely used in your institution?

Motivation

It seems that the term FC for most of the candidates started to appear around 2012 or later. Some had already experimented with alternative learning methods, and when the term FC started to pop up, they realized that much of what they already had been doing fitted quite well with FC.

> '*I was using it before it was called FC. Practice based learning and critical thinking are not done through a lecture.*'

> '*I picked up the term FC about 3 years ago. It sounded cool, but I thought: "I have been doing this for some years already."*'

The motivation for most of the candidates seems to be their own desire to find ways of improving the learning environment for their students. Only a few of them got their motivation due to organized activities or a defined strategy at their institution. Common for all of the candidates is the belief in student active learning, as opposed to the traditional lecture.

> '*To me, FC is an attempt to reach the individual, with greater or lesser success.*'

A motivation for flipping was also found for practical reasons. Some educators was in the process of delivering a course to several campuses, or to a mix of online and on-campus students. This fit well with placing resources online that could be used for several student groups at different geographical places. Another interesting practical reason was found with one of our educators. He was told to deliver a course he practically did not have enough time to deliver. He looked to FC as a way of being able to accomplish something that would be very difficult in a normal lecture setting in regard to the time available.

'*I was in a hurry, and I needed some good resources. It struck me that we teachers spend a lot of time making slides and preparing ourselves very thoroughly. Making compendiums and so on. Then I thought that it should be possible to make this more effectively. I spent a lot of time on the web on these online courses. MOOCs. Udacity and EdX, for example. So I wondered if I could use any of it. And by doing so, outsource some of the traditional lectures, and spend my time more efficiently in the classroom.*'

Material/resources and reuse

Traditionally FC is associated with videos made available for the students through some sort of online platform (e.g. YouTube). This also seems to be the case in this survey. Most common are videos tailored for use in an FC setting, but some also report they use just plain video recordings of a traditional lecture. The lecture is either published as is or it is split into shorter clips for each topic in the lecture before publishing. One of the candidates publish both entire lectures and the clips.

The use of video in a FC setting is well described within existing research projects, e.g. [10], [5], [2]. A much debated issue within our interviews was average or optimal length of such a video. Some claim that a video should not be more than 10 minutes, others say as short as 3-5 minutes. But an interesting comment was made by one of the candidates:

'*It's no problem if the videos get a bit long as long as the intensity is maintained.*'

Keeping the attention of the students, by maintaining the intensity in the video, was also mentioned by some of the other candidates.

But are good videos essential, and the main reason for success when using FC? One of the candidates made an interesting remark with regards to videos in FC:

'*I think it is a mistake to start with the videos when introducing FC. You have to start with the exercises. It is the exercises that provides learning. So the videos should be made to support the exercises.*'

The same candidate also questioned the use of video all together, or rather that we have a tendency when introducing FC to focus too much on the videos and not enough on the exercises:

'*I'm not convinced that we actually need video, or if the students should prepare by watching a video...Maybe it is useful for them to watch ONE 3 minute video, but after this first video, the students should start working on exercises, preferably under guidance.*'

One of the candidates used a lot of resources and videos produced by others, like Khan Academy, Open EdX etc. In primary schools and high-schools it is common that the same textbooks and teaching/learning material is being used across schools, and even in the entire country. Many teachers are excellent teachers, but only a very few are good authors. Hence most teachers do not write their own textbooks for use in their teaching. The same can be said about resources used at Universities and

University Colleges. Especially in introductory topics taught almost everywhere, like "Introduction to Object Oriented Programming". So why not leave the work of producing good FC resources to a few good teachers, instead of every teacher creating their own resources.

> '*When it comes to e-learning and other digital learning methods, it is not a must to create the material yourself. There is a lot of good quality out there. Should I do the same, I probably would have spent several years making similar resources with the same quality.*'

Student satisfaction and grades

According to the interviews, hardly any of the interviewed candidates had performed any scientific investigation into student satisfaction or whether the student grades had improved after introducing FC. But through the midterm evaluations performed in the courses, the candidates report that most students were satisfied with the introduction of FC. Many students said that FC gave them more flexibility in their learning. Since the student can prepare the theory in their own pace at their own time, they claim that their learning outcome increase. In terms of the resources made available online, several of the candidates reported that the students especially appreciated videos that show solutions to the assignments.

Regarding grades, the educators were very careful not to claim that FC in itself leads to better grades. But they all believed that FC, as a form of active learning, have a positive effect on student learning. They all had the *impression* that the average grades improved, or at least did not worsen. And those who had compared grades before and after the flip could confirm an improvement. But as this could be a result of other factors, they could not conclude anything. So, as they had no scientific evidence for improvement of grades, they emphasized that these were just impressions.

> '*Concerning grades, and now we must be very careful, I saw a slight improvement. I think the students were good at solving the practical cases at the exam. (...) But again, we must be careful. It was delivered [in a FC setting] once. Compared to grades earlier... And I was the one who evaluated the exams. So we have to be a little careful here.*'

Although some of our informants reported success on flipping the classroom on the first try, others told stories of how flipping is a process that takes time.

> '*What you have to think about is that I have done this now for at least 5 years and have made and found mistakes and improvements. So if you ask me today, then I can say that what I do now is the best I have ever done. And I'm saying that based on surveys and observations. (...) It's now, during the last year, I've really nailed it. Now I actually get 3-4 students every lecture approaching me saying that "This was just amazing. Finally I understood it, when you explained it to me. This was great!" I have never had that before.*'

Do the students prepare?

Flipping the classroom requires the students to go through the theory on their own, by the use of the online resources, before they turn up in the class to meet with the lecturer. This requires a larger degree of discipline from the students than traditional methods. The result is that many teachers that do introduce FC experience that students do not come to the class prepared.

This was also evident among the candidates. Most of the candidates reported that getting the students to meet prepared is probably the biggest challenge with FC. But there were different stories regarding this. A few did not find this to be a problem. Some reported that probably 1/3 of the students meet unprepared, 1/3 meet fairly prepared, while 1/3 meet well prepared to the class. Others reported that only 50 % of the students meet prepared, and only 10% of those again meet well prepared. One person had even a less optimistic estimate:

> '*10-20 percent, tops, meet to a certain extent prepared. There is almost no one who meets well prepared.*'

Several strategies are being used among the candidates to try to increase the number of prepared students:

- Start the class by letting some of the students present a summary of the theory. The students are informed in advance that they might be picked to do the presentation. This required class size not to be too large.
- Start the class with a quiz, where the students get points for correct answers. By letting the exam contain a subset of the same questions, the students knows that by answering the quiz they also prepare for the final exam.
- Encourage working in teams seems to also improve the degree of preparation. Some of the interviewed candidates use methods from Team Based Learning (TBL) [7] with success. If preparation is need in order to deliver something that other people rely upon, students will be more likely to prepare.

One of the more drastic measure being used, was asking those who have not prepared to stand up in the class, and explain why they did not prepare.

Some candidates pointed out the importance of preparing the students for what FC is. Explaining to the students the idea behind this method, and what is expected from both the student and the teacher, and the philosophy you as a teacher will be basing your teaching on.

One candidate had great success using case-based assignments in a team based setting to make the students prepare for the class.

Or, as pointed out by one of the candidates:

> '*If more teachers start using it, more students will be better prepared for class. So if we are to make FC succeed properly, then the majority must use it.*'

Size of classes and types of students

The interviews identified 3 areas to consider in terms of FC being successful or not; the size of the class, how strong or weak the students are in the subject matter, and at which level the students are in their program.

Size of the class

While the majority of the candidates were clear about FC working best with small student groups (typically 20-40 students), others stated that they had no problems using FC with as many as 600 - 900 students. Large classes can be solved by the use of learning assistants and the use of peer-review techniques.

One candidate pointed out that there are more than one way of doing the guided classroom activity. If the class is small, you can provide individual guidance by walking around in the classroom. With a large group of students (200+) you can guide by "cherry picking"; i.e. give advice on what direction to focus, what part of the curriculum to focus on etc. for the entire group in the class.

Strong and weak students

Quite a few of the candidates reported that they struggled getting the weak students to meet prepared, and meant that FC was probably not the best learning method for them.

One candidate believed that FC is best suited for the middle to strong student. They are more likely to benefit from the advantages of FC. It is demanding for most students to be able to set aside time for preparations. It is often the well organized students that manage to do this.

Another interesting view came from an educator saying that we should not forget the really strong students when flipping:

> '*The good ones arrive prepared, and then they will not attend anymore. Because they do not bother to come. They find that when they arrive, they are a minority, and the only thing that happens is that the lecturer goes through things that they know. It does not give them anything.'*

At what level in their program

Most of the candidates did not have a strong opinion in terms of FC being better suited for students in their final years, than for students in their first year. However, one of the candidates was very clear in that first year students are not mature enough for FC. They come from an education system very different form FC. Hence it is vital to have a long term plan in preparing the student in order for the student to benefit from FC:

> '*First year I give them a textbook, and in the lecture I refer to the book. I do a lot of scaffolding in the first year. In the second year I give them some lectures, but I give them some pointers to content and tutorials (..). And when a student find a good tutorial he tells me, and I share it with the rest of the class. In the third year, I do have a text book but I never refer to it. I tell them: "Here is a good book, you should have access to it. We have a project focus, so look into it when you need to." We look at websites, and I tell them to also find some additional material. By the semester 6 course we start with a shared spreadsheet with a couple of online resources to get them started, and then the students are finding additional material online, and add this to the shared spreadsheet. I seed it with a couple of resources, but they add the most of it. So by the end of the 3rd year I hope they are able to find material and evaluate the usefulness on their own.'*

The use of FC among colleagues

It is interesting to note that all of the candidates indicated that very few of their colleagues were using FC. Most of the candidates were all by themselves, while some had one or two colleagues they worked together with practicing FC.

Some of the thoughts on why this was the case:

- It is quite demanding and time consuming creating good videos and other online resources. Or, as one candidate stated, it is a common misconception that it is.
- Some teacher find the use of digital resources and teaching tools challenging and demanding.
- There are no common centralized strategy or focus in the institution that supports or encourages the teachers to investigate new teaching methods like FC.
- There is an uncertainty when leaving the pedagogical platform one is used to. Leaving that platform may be intimidating.

> '*A large proportion of those who teach want to turn the pile and do the same over again. If you have made the slides once, you have spent time on it, so you want to use it. Secondly, that's the way they feel comfortable doing it. There are very few who dare to expose themselves. (...) You must be quite professionally good at what you do, and you must be quite confident in the subject matter.*'

> '*The institution is set up to mainstream us in the way we teach, which can be very limiting.*'

> '*I think there are many who are curious. But most institutions do not have any similar learning lab, like for instance BI[Norwegian Business School] has, so we have not institutionalized being curious - encouraging us to constantly develop our teaching methods.*'

5 Discussion

When it comes to resources in use when preparing for classroom activities, we find a wide variety in use as also reported by O'Flaherty and Phillips [9]. Another similarity is that video is the most common type of resource. These video resources are created in many different ways. Some start out by recording lectures. Some start with collecting existing videos online. The possible production of these resources are important. The overall idea that flipping a classroom is resource intensive is reported by our informants to scare educators away from flipping the classroom. And that specific cost was also reported by Giannakos, et al. [4] to be a key challenge. But as we heard from one of or informants, reducing costs may actually be a motivation for a flip. But if so, the existence of already available resources is a necessity.

The in-class activities do also vary a lot. The overall general opinion is that the in-class activities should activate the students in some way or the other. Some educators referred to the scientific results of Foldnes [3] and therefore emphasized cooperative assignments to increase learning. And when aiming for cooperative

assignments, putting students together in groups to solve tasks that just as well could be solved individually was not enough. The teacher should create assignments where a group is needed to discuss and collaborate.

Most of the educators we talked to had no specific opinion on the perfect time to start flipping the classroom. Many of the teachers we talked to had only a few, or only one, course where they had tested flipping the classroom. An therefore, it was hard for them to compare flipping at different stages in higher education. O'Flaherty and Phillips [9] could find no evidence for the perfect year to flip through their literature review. But one of our informants was very clear that flipping the first year was not a good idea. This particular teacher had a lot of experience of flipping the classroom in multiple stages in education from Bachelor to Master level. His opinion was that the students were simply not ready for the approach having recently been released from the Norwegian school system. They need time to adjust to the increased responsibility on the students in their learning process. This leads to an interesting question. Should we wait with exposing our students to FC as they are not ready for it, or should we use FC early to introduce them to some key concepts within learning theory, including the concept of active learning?

There are indications that making our students more aware of learning theory is a good idea. Many of our informants tell stories of students being overly focused on lectures. If they attend the lectures, they can consider the most important job done. This could be explained by their experience with the Norwegian high school system where attendance is mandatory. There seams to be a general opinion that the most important learning arena is in a classroom where the teacher delivers information for the pupils to receive. And when educators in higher education experiment with less known pedagogical concepts like FC, confusion may occur. Especially when this is done in parallel with other courses using the traditional lecture style. This teacher refers to the time they restructured the delivery and moved away from the traditional lecture/lab:

> '*They [the students] wanted to know when it was lecture and when it was lab. [Imitating a typical conversation between the lecturer and students] Lecturer: Why? Student: Because then we know ... Lecture is important to attend. Lecturer: Why is lecture important to attend? Student: That's where we learn theory. Lecturer: Do you not learn theory in lab?*
>
> *For them it was important to distinguish between lecture and lab time.'*

The student impression of lectures as the most important element in the students education was supported by multiple educators. Flipping the classroom will also involve putting a larger responsibility on the students. From the teachers side: Many fear that flipping involves high costs in regard to time spent. They have to expose themselves more than when giving a standard lecture. And if there is no clear incentive from the institutions side, the use of FC or other active learning alternatives will be limited. Both students and lecturers may be happy with a status quo.

6 Conclusion

In our study, we wanted to take a qualitative approach to finding out more about the status of FC in higher Norwegian IT education. Existing research on the topic is

normally described through quantitative measures, or by focusing on the students. We talked to the educators, and listened to their stories. Our findings are very much in sync with existing research. The educators report success on course deliveries with happy students and teachers. Our informants are very careful when they describe exam results, but they all report equally good or better results than before the flip.

And although our informants express a lack of incentives from their educational institutions, we see a tendency that times are changing. Multiple higher educational learning centers appear within the country, and they are discussing and sharing teaching methods. And there are clear incentives from the government to do so. So in the near future, we believe that experimenting with active learning activities in higher education will be much more accepted both by faculty and the students.

7 Acknowledgement

A big thank you to all educators who shared their time with us to tell their stories. You are a true inspiration with your passion for teaching and pedagogy. Keep experimenting with new teaching methods with the goal of providing the best education possible for our students.

References

[1] Jacob Bishop and Matthew Verleger. Testing the flipped classroom with model-eliciting activities and video lectures in a mid-level undergraduate engineering course. *Proceedings - Frontiers in Education Conference, FIE*, pages 161–163, 2013.

[2] Suzanne L. Dazo, Nicholas R. Stepanek, Robert Fulkerson, and Brian Dorn. An Empirical Analysis of Video Viewing Behaviors in Flipped CS1 Courses. *Proceedings of the 2016 ACM Conference on Innovation and Technology in Computer Science Education - ITiCSE '16*, pages 106–111, 2016.

[3] Njål Foldnes. The flipped classroom and cooperative learning: Evidence from a randomised experiment. *Active Learning in Higher Education*, 17(1):39–49, 2015.

[4] Michail N. Giannakos, John Krogstie, and Nikos Chrisochoides. Reviewing the flipped classroom research: Reflections for computer science education. In *Proceedings of the Computer Science Education Research Conference*, CSERC '14, pages 23–29, New York, NY, USA, 2014. ACM.

[5] Robin H. Kay. Exploring the use of video podcasts in education: A comprehensive review of the literature. *Computers in Human Behavior*, 28(3):820 – 831, 2012.

[6] Maureen J. Lage, Glenn J. Platt, and Michael Treglia. Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, 31(1):30–43, 2000.

[7] Larry K. Michaelsen and Michael Sweet. The essential elements of team-based learning. *New Directions for Teaching and Learning*, 2008(116):7–27, 2008.

[8] B J Oates. *Researching Information Systems and Computing*. SAGE Publications, 2005.

[9] Jacqueline O'Flaherty and Craig Phillips. The use of flipped classrooms in higher education: A scoping review. *Internet and Higher Education*, 25(May):85–95, 2015.

[10] Chaohua Ou. Designing Videos with Pedagogical Strategies : Online Students ' Perceptions of Their Effectiveness. *Proceedings of the Third ACM Conference on Learning @ Scale*, pages 141–144, 2016.