

Collaborative Learning and Student Engagement in the Flipped Classroom

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20000 students. Triple Crown. ranked 35th in the Financial Times ranking of European Business Schools



we made an effort, since it was not only up to each of us as individuals, but as a group. A community formed, it was fun to come and meet people. And math became fun. It was nice to sit together, and after a while we got to know each other and started to discuss more and more. There was really a sense of community around math

Agenda

- Discussion of the flipped classroom and higher education
- Student achievement (paper 1)
- Student perceptions (paper 2)
- Class attendance, perceptions and achievement (paper 3)

Definition

Flipped classroom is characterised by (Abeysekera and Phillip 2014)

- Moving information-transmission teaching out of class
- Using class time for active and social learning
- Requiring students to complete pre- and/or post-class activities to fully benefit from in-class work

The lecture format

- During lectures, students listen passively to an expert, which gives a continuous exposition of material to learn. Expert is at the center.
- During active learning, students engage themselves in activities and discussions. The student is at the center.

A central meta-analysis for STEM:

<http://www.pnas.org/content/111/23/8410.full.pdf>

A very fresh meta-meta-analysis for higher ed

Variables Associated With Achievement in Higher Education: A Systematic Review of Meta-Analyses

Michael Schneider and Franzis Preckel
University of Trier

The last 2 decades witnessed a surge in empirical studies on the variables associated with achievement in higher education. A number of meta-analyses synthesized these findings. In our systematic literature review, we included 38 meta-analyses investigating 105 correlates of achievement, based on 3,330 effect sizes from almost 2 million students. We provide a list of the 105 variables, ordered by the effect size, and summary statistics for central research topics. The results highlight the close relation between social interaction in courses and achievement. Achievement is also strongly associated with the stimulation of meaningful learning by presenting information in a clear way, relating it to the students, and using conceptually demanding learning tasks. Instruction and communication technology has comparably weak effect sizes, which did not increase over time. Strong moderator effects are found for almost all instructional methods, indicating that how a method is implemented in detail strongly affects achievement. Teachers with high-achieving students invest time and effort in designing the microstructure of their courses, establish clear learning goals, and employ feedback practices. This emphasizes the importance of teacher training in higher education. Students with high achievement are characterized by high self-efficacy, high prior achievement and intelligence, conscientiousness, and the goal-directed use of learning strategies. Barring the paucity of controlled experiments and the lack of meta-analyses on recent educational innovations, the variables associated with achievement in higher education are generally well investigated and well understood. By using these findings, teachers, university administrators, and policymakers can increase the effectivity of higher education.

Figure 1: Psych. Bull.

Research on the flipped classroom

Still in an early phase

- A variety of research designs, few well designed studies
- We need to develop pedagogical theory to guide our implementation of the flip
- Findings are not consistent

Scoping review (O'Flaherty and Phillips 2015) and call for research (Abeysekera and Phillip 2014) underline the need for:

- Better conceptual framework
- Qualitative analysis of student perceptions
- Meta-studies
- Experimental studies

Two relevant pedagogical theories

Self-determination theory (Ryan og Deci) Motivation increases if the student

- feels competent to master the knowledge
- feels in control and independent
- feels associated with a social group

Cognitive load theory

by encouraging students to manipulate the pace of these videos we argue there may be gains in learning, as learner pacing can help manage cognitive load (Abeysekera and Phillip 2014)



Figure 2: In class session



Figure 3: Open-closed physical learning environment



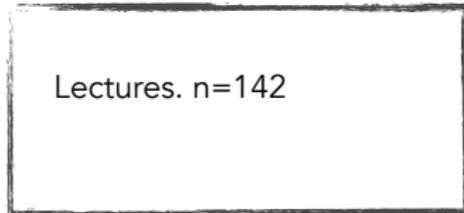
Figure 4:



Figure 5:

Two first studies

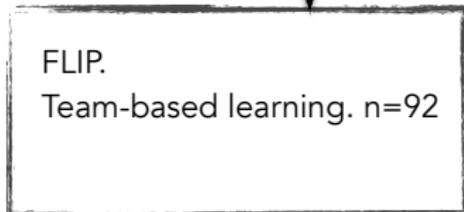
First semester



Paper 1.
Quantitative.
Test scores.

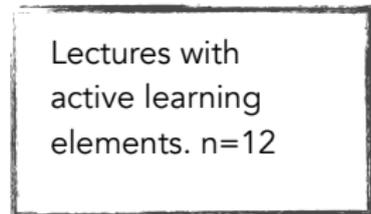


RCT



Second semester

Paper 2
Qualitative.
Student reflections



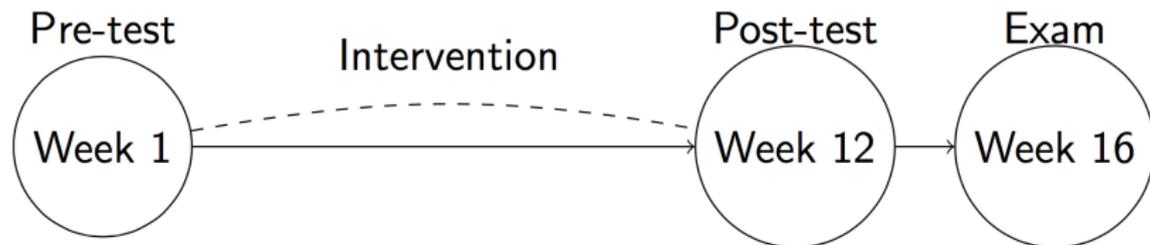
Study 1: A randomised experiment

Implemented a collaborative flipped classroom for first-year math students

- New material released every week (synchronicity)
- Class time organised around fixed, heterogenous teams, inspired by Michaelsens team-based learning

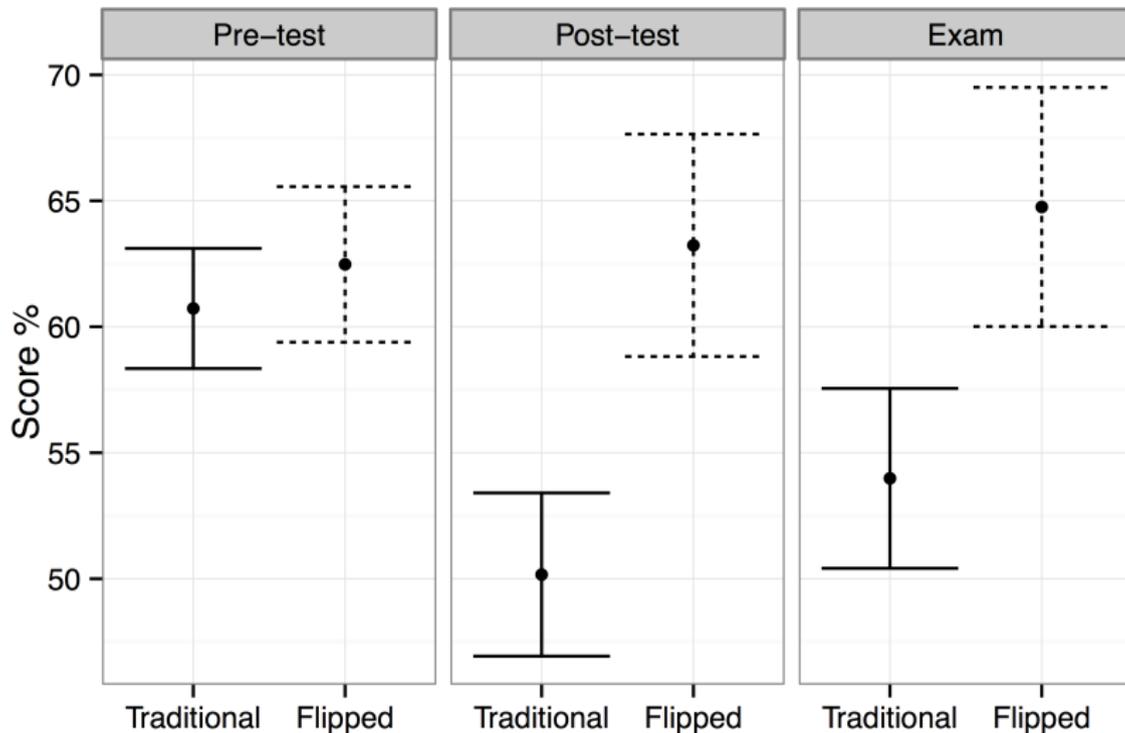
Foldnes, N. “The flipped classroom and cooperative learning: Evidence from a randomised experiment.” Active Learning in Higher Education 17, no. 1 (2016): 39-49.

Design

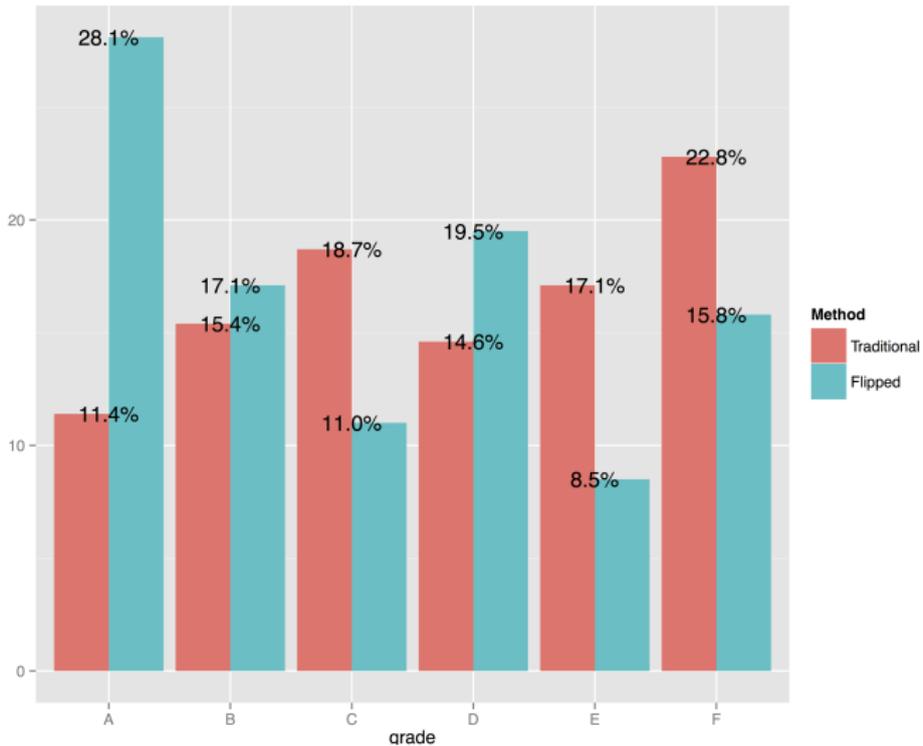


- 93 students did flipped
- 142 students did lectures

The flipped group outperformed the lecture group



Exam



Study 2: Investigating Student Engagement

Flipped first semester

- Out-of-class: 2-3 videos. Youtube.
- In-class: Individually solving problems, 60 minutes.
Teamwork for 80 minutes, team answer recorded. Debriefing on small blackboard, 30 minutes.

Active lectures second semester

- Out-of-class: Textbook exercises
- In-class: 60 minute lecture. Then individual our group solving of problems, 80 minutes. Debriefing 30 minutes.

Paper 2 is joint work with Anna Steen-Utheim from BI Learninglab.

Established theory: Dimensions of Student engagement

- Behavioral (effort and participation)
- Cognitive (deep learning and self-regulation)
- Affective (enthusiasm, interest and belonging)

Kahu, Ella R. "Framing student engagement in higher education." Studies in higher education 38.5 (2013): 758-773.

Method

- twelve students
- semi-structured in-depth interviews
- content analysis

Abstract

The flipped classroom is gaining acceptance in higher education as an alternative to more traditional methods of teaching. . . . twelve students in a Norwegian higher education institution were in-depth interviewed about their learning experiences in a two-semester long mathematics course. The first semester was taught using flipped classroom and the second semester using lectures, where both teaching modes contained a substantial amount of active learning. Overall, students report a more positive learning experience and higher engagement in the flipped classroom. The analysis revealed seven categories that the students highlight as especially conducive to their learning;. The results indicate that the affective dimension of student engagement is particularly prominent when students reflect upon learning in the flipped classroom.

Seven Emergent Themes

- Commitment to peers
- Being recognized
- Feeling safe
- Instructor relation
- Learning with peers
- Physical learning environment
- Using videos to learn new content

Commitment to peers

Even though showing up to work with the group to solve problems was optional, it did not feel optional. You feel more obliged to come to the class session because you belong to a group. (Vibeke)

... a somewhat compulsory discipline that made me participate in the group work. It was easier to come to class because of the group. You go to your group and then all members must contribute. (Martin)

Being recognized

... in flipped, what is expected of you is more visible. This makes you want to perform well in group, you do not want to appear as someone who can not solve problems - In a lecture hall you can hide. You cannot hide in a flipped classroom. Many students need to be seen and to be motivated. (Inger)

In flipped, the instructor sees you, that you do well, or says “okay, let us help you a little bit”. And for me, this is crucial. I am not motivated by money or other external rewards. But being recognized, being told ‘I see that you are good in math’, is important, especially if you struggle with math. (Terese)

Instructor relation

I liked the instructor availability [in the flipped classroom] in contrast to a instructor lecturing to many students. I feel one can better master the subject then, with a better relation to the instructor, because you feel more safe and you look forward to coming to class. (Cecilie)

It was nice to have a more personal relation to the instructor [in the flipped classroom], that he came by and talked to us during the class sessions. As a consequence, it is now easier for me to come by his office and talk to him. (Peter)

Learning from peers

We asked a lot of questions in the group. If an exercise was hard, we did not give up until each group member said, “yes, I got it, I understand”. It was ok to redo the exercise eight times, if needed. It started usually with one of the “brains” having understood how to solve it, and explaining it to us. Then, one of us had the “aha” experience, and then this person could rephrase the explanation for us who did not yet understand. You see, having such an aha experience, we can suddenly understand why and what our peers do not understand, and we can explain better to them. (Vibeke)

Physical environment

In the lecture hall you sit in long rows. It is hard to form groups there like we did in the flipped classroom (Inger)

You sit in a confined space, with barely room for your notebook. There is no blackboard in vicinity. If a peer student wants to explain things, there is kind of no space for explaining. (Vibeke)

Learning new content from videos

[...] it was the element of videos that I liked the most about flipped. (Markus)

I take notes during lectures, and also when watching videos. I stop the video and take notes. During lectures, things move too fast sometimes, so that you almost have to give up taking notes. With videos it is nice to be able to write in your own speed, and calculate at your own speed. (Terese)

Paper 3: Class attendance and academic achievement

- Purpose: to investigate how learning outcomes in a large flipped classroom are affected by the student's attitudes and class attendance.
- For the student it is important to know whether substantial learning opportunities are available in the flipped class sessions.
- For the instructor it is important to know whether the work needed to redesign in-class sessions for active and social learning will lead to increased student learning.

Findings

- Controlling for initial mathematical skill and attitudes, we found a substantial effect of class attendance on student achievement.
- standardized coefficient of class attendance on performance was 0.28
- Neither attitudes nor initial mathematical skill predicted class attendance.
- Availability of online videos does not eliminate the need for carefully designed in-class sessions in order to maximise student learning. Communicating this finding may help reduce absenteeism in the flipped classroom.

Foldnes, N. "The impact of class attendance on student learning in a flipped classroom" Nordic Journal of Digital Literacy (2017).

Conclusions

- Flipped classroom is only a framework
- With proper implementation, students become more engaged and learn more.
- It is really enjoyable to teach in the flipped classroom.
- The affective dimension is particularly prominent when students reflect upon learning in the flipped classroom.
- Publishing empirical work in higher education journals is not more difficult than publishing methodological innovations in statistics journals.