9

Students' perceived learning outcome and attitudes towards non-traditional lecturing

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Over the years consensus seems to have grown in the pedagogy literature that traditional lecturing is ineffective, because it generally does not promote active learning. Through active learning students actively work with the course content and it helps transferring the content in their long-term memory. Thus, teachers should embrace alternatives such as flipped classroom and other peer learning methods.

In a flipped classroom, the usual "content delivery" is moved primarily outside the classroom so that time in the classroom can be devoted to a variety of other activities that promote active learning. However, this necessarily requires more preparation from students than for traditional lectures and a successful implementation of a flipped classroom hinges on the willingness of students to cooperate by preparing in advance for the lectures. Since students are so accustomed to traditional lectures they might be hesitant (or even opposed) to a flipped classroom, because they might not perceive it as more beneficial to their own learning than a traditional lecture format. Furthermore, students might think that teachers are shifting the "burden" onto students such that they are "doing our (teaching) job". This motivates an interesting research question: *How do students perceive their own learning in flipped classroom/peer learning vs traditional lectures? What are their attitudes towards traditional lectures, flipped classroom and peer learning?*

A constructive alignment analysis as part of the Universitetspædagogikum revealed some misalignment between intended learning outcomes (ILOs), learning activities and assessment of the "Economic efficiency and benchmarking" (NIFK16001U) course. In order to improve the constructive alignment of this course and to investigate the above research questions, I

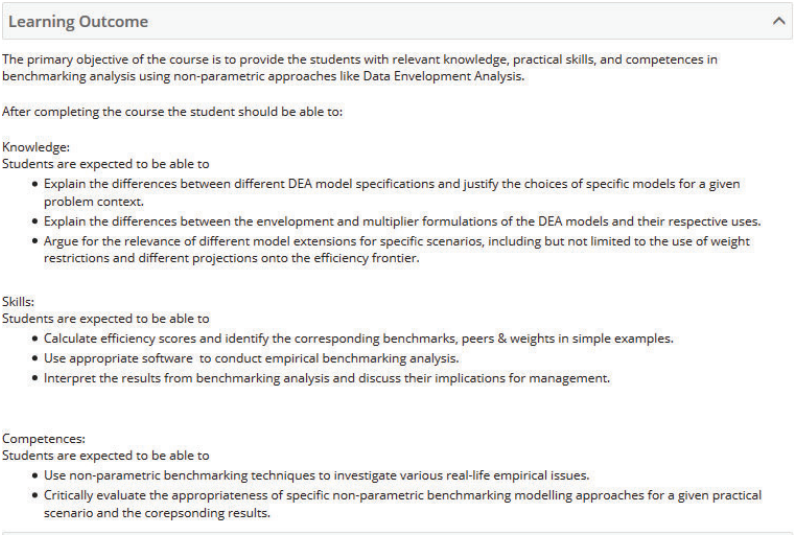
conducted an intervention in this master course where I am a guest lecturer for 4 lectures in total (4 x 3h) during the academic year 2018-2019. Thus, (figuratively) "killing two birds with one stone".

Context of the study

The course "Economic efficiency and benchmarking" (NIFK16001U) is an elective master-level course in English of 7.5 ECTS open to all students, but mainly taken by students in the MSc in Agricultural Economics and MSc in Environmental and Natural Resource Economics (and some students from Copenhagen Business School). The ILOs are in Figure 9.1 (or online at following link: https://kurser.ku.dk/course/nifk16001u).

The teaching format consists of traditional lectures with in class exercises. It is a relatively small student group: although the course capacity is set at 50, around 20 students signed up for the course in 2017-2018. This academic year (2018-2019) 15 students signed up and 13 completed the exam.

A project report conducted in small groups of students (usually 2 students, sometimes 3 students) is the basis for the individual oral assessment. Students are completely free to choose the topic for their project and the research question. We expect them to do their project using the tools they learn in the course. During the oral exam, we critically discuss their project and ask questions about material from the course (which they applied or did not apply in their project).



Learning Outcome

The primary objective of the course is to provide the students with relevant knowledge, practical skills, and competences in benchmarking analysis using non-parametric approaches like Data Envelopment Analysis.

After completing the course the student should be able to:

Knowledge:
Students are expected to be able to

- Explain the differences between different DEA model specifications and justify the choices of specific models for a given problem context.
- Explain the differences between the envelopment and multiplier formulations of the DEA models and their respective uses.
- Argue for the relevance of different model extensions for specific scenarios, including but not limited to the use of weight restrictions and different projections onto the efficiency frontier.

Skills:
Students are expected to be able to

- Calculate efficiency scores and identify the corresponding benchmarks, peers & weights in simple examples.
- Use appropriate software to conduct empirical benchmarking analysis.
- Interpret the results from benchmarking analysis and discuss their implications for management.

Competences:
Students are expected to be able to

- Use non-parametric benchmarking techniques to investigate various real-life empirical issues.
- Critically evaluate the appropriateness of specific non-parametric benchmarking modelling approaches for a given practical scenario and the corepsonding results.

Fig. 9.1. Intended learning outcomes of the "Economic efficiency and benchmarking" (NIFK16001U) course.

Related literature

A poll conducted by Herreid and Schiller (2013) among STEM teachers identified some pitfalls of the flipped classroom: one reported pitfall is that "students new to the method may be initially resistant to because it requires that they do work at home rather than be first exposed to the subject matter in school."

Roach (2014) reports on a case study of an implementation of a partially flipped classroom in a microeconomics course: only 1 lecture out of 3 per week was flipped. Interestingly for our case, the case study's focus is to gauge the students' reaction and perceptions towards a flipped classroom. The study finds that students respond positively to the partially flipped classroom.

Similarly, Butt (2014) surveyed the attitudes of students towards lectures in general and towards the flipped classroom in a final year actuarial course. Students response was generally positive with a 25% minority that viewed flipped classroom as not beneficial to their learning.

Bishop and Verleger (2013) survey recent literature on flipped classroom and report on 11 studies conducted at the undergraduate and high school level that focus on student perceptions of the flipped classroom. The results are generally consistent: general student perception of flipped classroom is positive with a significant minority opposed to it.

Set-up

Motivation

As part of the Universitetspædagogikum course I analysed the constructive alignment of the course "Economic efficiency and benchmarking" (NIFK16001U). This revealed that the learning activities do not entirely support the intended learning outcomes: the traditional lectures (with small exercises and examples on paper) mainly support the "Knowledge" ILOs and to a lesser extent the "Competences" and "Skills" ILOs. This misalignment is a problem for students, because we assess the students by an individual oral presentation of a written group report and subsequent oral examination. This report is the result of a small research project where the students choose their own case for which they do a benchmarking analysis using the tools they learned in the course. For their project however, they need the "Skills" and "Competences" described in the ILOs. Here, flipped classroom for some relevant lectures might help in resolving this misalignment as well by stimulating active learning.

Intervention description

After brainstorming with the course coordinator, we decided to (i) split one lecture into two and; (ii) flip this new lecture ("DEA pitfalls and protocols") and introduce a new flipped lecture ("Critical evaluation of empirical benchmarking applications"). Thus, there is an even split between lectures taught in a traditional lecture format and a flipped classroom format. This also has the advantage that there is no variation in the quality of the teacher when we compare the results of the survey between traditional lectures and flipped classroom (assuming my qualities as a teacher are independent of the teaching method of course!).

We settled on this particular choice of two flipped classroom lectures, because we thought them well suited to develop the students "Skills" and "Competences" as described in the ILOs:

1. "DEA pitfalls and protocols"-lecture: this lecture deals with frequently encountered modelling mistakes and draws attention to some important modelling choices that the students will also encounter during their project.
2. "Critical evaluation of empirical benchmarking applications"-lecture: we introduced this new lecture this academic year 2018-2019 where students read three anonymized student reports from a similar course at Copenhagen Business School a couple of years ago. The goal is that students learn to evaluate critically the appropriateness of the chosen models; the conclusions drawn from the results and identify possible limitations and alternative approaches.

In case of the "DEA pitfalls and protocols"-lecture, I asked the students to carefully read a paper, available on Absalon, at home. Students could also take an online multiple-choice questionnaire on Absalon before class to test their understanding. This questionnaire consists of simple questions, which they can answer when they have read the paper. For the "Critical evaluation of empirical benchmarking applications"-lecture[1], I simply asked them to read the reports and prepare both positive and critical comments. To aid them, I provided a "rubrik": this contains simple questions about a part of the analysis to ask themselves while reading the reports. Two examples of questions the rubrik contained: *"What is the research question of the paper?"* and *"What are the assumptions of the model? How plausible are they in the current setting?"*.

I also gave students the option to submit a project proposal for peer-review through Peergrade.io on a voluntary basis.[2] The motivation was that this gives the students some early, formative feedback on their project. This gives the students the chance to correct and change their project as needed before doing the actual analysis. Another advantage is that students could more easily learn from each other and that I offer a different way for students that are less comfortable with speaking-up in class to interact with their peers. The "Critical evaluation of empirical benchmarking applications"-lecture thus served as a training to prepare them for the peer-review exercise.

[1] Unfortunately, this lecture was scheduled the Thursday before the start of the Christmas break and only 4 students participated in this lecture as a result.

[2] 9 students submitted a project proposal and 5 subsequently gave feedback.

Data collection

Before the start of my own teaching I made a pre-intervention survey available to students on Absalon. The survey asked students about their (i) previous experiences with, (ii) attitudes towards and (iii) perceived effectiveness of traditional lecturing, flipped classroom and peer learning.[3] The full survey is in Appendix A. The survey had a response rate of 61.5% (8/13).

I distributed a similar post-intervention survey to each student right after the exam for them to fill in while they waited for our deliberation on their grade.[4] I chose this approach for two reasons: (i) I expected that students would only see the full benefits of the intervention after they had handed in their project and had finished their exam; (ii) I did not expect many students to finish the survey after the exam period. The post-intervention survey had a response rate of 76.9% (10/13). In both cases I collected the students' email so I can match pre-intervention and post-intervention responses.

Results

Given the small sample size, these results are descriptive at best and no wider conclusions can be drawn from it.

Pre-intervention survey

The first question asked them how frequently they have experienced these different teaching methods in the past. Figure 9.2 provides a summary of the results. Clearly, traditional lecturing is still very popular as all students selected "most of the time". In contrast, only 3 students experienced flipped classroom more than once before and 2 students had one earlier experience with it. 5 students experienced peer learning more than once before and 1 only once before. Overall, I conclude that the students are very used to traditional lecturing and much less used to (i.e., never or only once) flipped classroom (5 students) or peer learning (3 students).

[3] I provided a definition of these different teaching methods at the start of the survey.

[4] Naturally, they were also allowed to hand in the survey later.

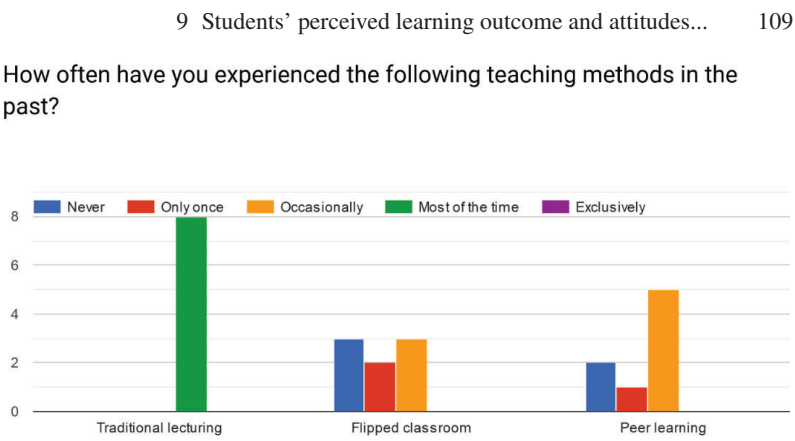


Fig. 9.2. Frequency of different teaching methods in the past.

Next, I asked about their attitudes towards these teaching methods. All students had a positive attitude towards traditional lecturing: 6 "like it" and 1 even "love it" (Figure 9.3). Attitudes towards the flipped classroom was less positive with only 1 student "like it" and 2 students indicating "it's fine". As many students (i.e., 3) were neutral towards flipped classroom. Results are even less positive for peer learning where only 1 student had positive attitude towards it and 4 were neutral. Finally, 1 or 2 students gave inconsistent responses when comparing with the previous question: 3 students indicated they never experienced flipped classroom in Figure 9.2 vs 2 students in Figure 9.3 (and 2 students vs 1 student for peer learning). This could indicate that they have a prejudice against both teaching methods.

Following-up on this question, the survey asked them to clarify why they *"feel this way about [teaching method]"*. A large majority of students gave responses for traditional lecturing that can be summarized as "I like it because I'm used to it" or "This is the best method for me to learn". One student answered:

"Depending on the barrier to asking questions, I think traditional lecturing (with projects/exploitative elements on the side) is the most efficient, when looking at time spent vs material learned. A professor became a professor for a reason, so in my opinion you should learn from them, rather than from other students."

Another student wrote:

"I like this way of teaching because it works well for me. I think that when trying something else it often fails, and becomes a waste of time."

Thus, the students in this sample prefer traditional lecturing, because (i) they think they learn best from (passive) listening to a lecture; (ii) Other teaching methods they experienced before failed and felt like a waste of time; and (iii) a university teacher is seen as an authority figure that has all the knowledge to be learnt.

For flipped classroom, one student admitted that it "could actually boost more our learning experience", but expressed fear that it would not work that well if the course material is difficult. Another student wrote: *"If there is enough time to prepare before class, it is probably the best method! Nevertheless, it is not always possible to read everything is needed for the class, then it become somehow counterproductive."*

For peer learning, some students wrote that it is very dependent on student cooperation in the class and therefore can have mixed results. One student expressed feeling insecure that he/she "won't get it right" when presenting. Another acknowledged that presenting to peers contributes towards their own understanding of a topic, but found it hard to do because he/she lacks "teaching methodology".

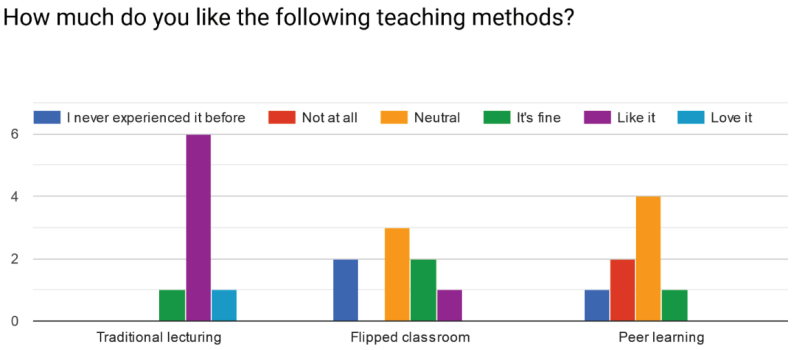


Fig. 9.3. Attitude towards different teaching methods in the past.

The final question asked students about the perceived effectiveness towards achieving the ILOs of these teaching methods (Figure 9.4). All students perceived traditional lecturing as (somewhat) effective in helping

achieve the ILOs: 6 students indicated that it is "effective" or "very effective" and 2 stated it is "somewhat effective".

Opinions are more mixed for the flipped classroom, but still quite clear: while 3 students think it is "effective" and 1 thinks it is "somewhat effective", 3 students indicated "neutral" and 1 "not really effective". Looking into the individual answers in more detail it is interesting to see that students that actually experienced flipped classroom "occasionally" or "only once" before think it is neutrally effective (1 student), somewhat effective (1 student) or effective (3 students). The student judging flipped classroom as "not really effective" also "never" experienced it before. Thus, flipped classroom might suffer from some negative prejudices against it by students.

For peer learning the results seem to indicate that students have had mixed experiences in the past. Of the 5 students perceiving it as "not really effective", 3 students experienced it "once" or "occasionally" before while holding a "neutral" or negative ("not at all") attitude towards it. The 2 remaining students that perceive it as "not really effective" have never experienced it before with 1 indicating a negative attitude towards it. The 2 students perceiving it as "somewhat effective"/"effective" have experienced it "occasionally" and have mildly positive attitude towards it ("neutral" or "it's fine").

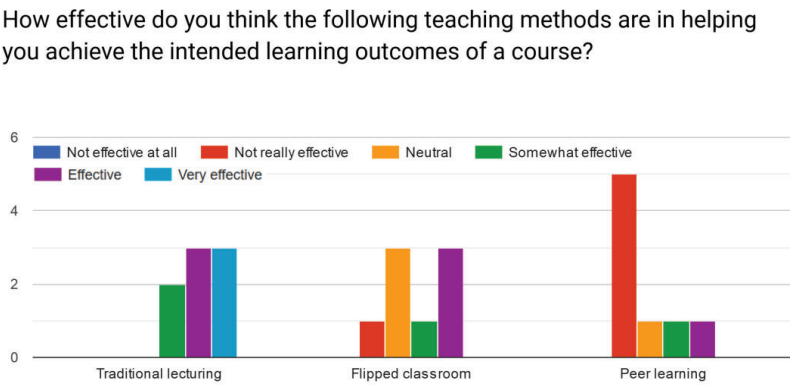


Fig. 9.4. Perceived effectiveness of different teaching methods in the past.

The conclusions I draw from these are:

- Traditional lecturing is used most of the time, students have positive attitude towards it and perceive it as a (rather) effective teaching method.
- Those students that experienced flipped classroom before perceive it as rather effective and none have a negative attitude towards it.
- Students have had mixed experiences from peer learning with a rather negative attitude towards it.

These less clear-cut answers for peer learning are not really a surprise: peer learning is very dependent on the students' participation and a teacher generally has less control over what they get out of it. Flipped classroom and traditional lecturing are much more teacher controlled.

Post-intervention survey

The basic questions of the post-intervention survey are the same as the pre-intervention survey. I first present the results of the entire post-intervention survey (10 students) before limiting to the students that filled in both the pre- and post-intervention survey (6 students).

Figure 9.5 and 9.6 present the results for all respondents. Students are generally positive towards traditional lecturing and see it as quite effective in achieving the ILOs of the course. A majority of students (7/10) has a positive attitude towards flipped classroom and only 1 student does not like it at all. Further, an even larger majority of 8/10 students perceives it as (somewhat) effective in achieving the ILOs of this course. The 2 remaining students perceive it as "not really effective". Finally, attitudes towards peer learning are more mixed: 4 students are (somewhat) positive towards it, 4 are neutral and 2 do not like it at all. In terms of perceived effectiveness, 6 students see it as (somewhat) effective, 1 is neutral and 3 perceive it as not really effective.

Finally, the post-intervention survey also asked students *"Did [teaching method] help you prepare for the final project?"*. For traditional lecturing and flipped classroom students overwhelmingly agreed with this statement. Only 1 student answered "maybe" for both teaching methods. Opinions are more mixed for peer learning: 3 students answered "Yes", 1 "Maybe" and 5 students answered "No".

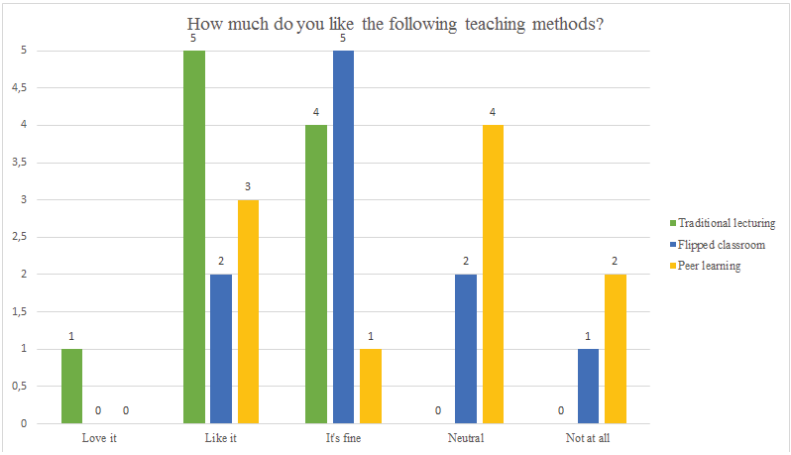


Fig. 9.5. Attitude towards different teaching methods after the course.

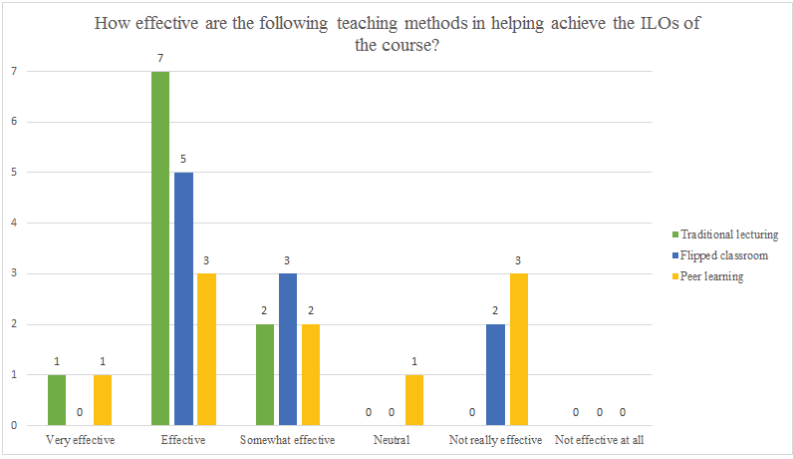


Fig. 9.6. Perceived effectiveness of different teaching methods after the course.

Impact of intervention

In order to get an idea of the impact of the intervention, one must compare the results of the survey for the same students. In both surveys, I asked for the students' email so that it allows me to match results of both surveys to the same students. In doing this I can directly compare the results of 6 students (6/13 = 46%).

Figure 9.7 and 9.8 summarize the results for these 6 students. The top figure shows the results of the pre-intervention survey and the bottom figure shows results of the post-intervention survey. For traditional lecturing, there has not really been much change in attitude and perceived effectiveness: attitude remains positive and there seems to be some more consensus that it is "effective" in helping them achieve the ILOs of the course.

The results for flipped classroom are a little bit more interesting: although there is not really a shift in attitudes towards flipped classroom, the students have a more positive view on its perceived effectiveness (i.e., all student responses in Figure 9.8 are "effective" or "somewhat effective"). The 2 students that never experienced it before now answered "it's fine". Furthermore, 2 students changed opinion: 1 from "neutral" to "it's fine" and 1 vice versa.

The biggest shift occurred for peer learning: 1 student now likes it and only 1 student does "not like it at all" (vs. 2 in the pre-intervention survey). Only 2 students' attitude remained unchanged: 1 answered "not like it at all" and 1 answered "neutral" in both surveys. Thus, the intervention generally seems to have had a positive impact on the students' attitude. This shift is even more pronounced for the perceived effectiveness (Figure 9.8): whereas in the pre-intervention survey 4 students indicated "not really effective", only 1 student did in the post-intervention. In fact, this is the only student whose perceived effectiveness changed negatively for peer learning (i.e., from "neutral" to "not really effective"). Moreover, in the post-intervention survey 3 students perceive it as "effective" (vs. 0 students in the pre-intervention survey) and 1 student as "somewhat effective" (vs. 1 student before).

Thus, I conclude that the most dramatic impact of the intervention has been on (i) the attitude towards and perceived effectiveness of peer learning and (ii) the perceived effectiveness of flipped classroom.

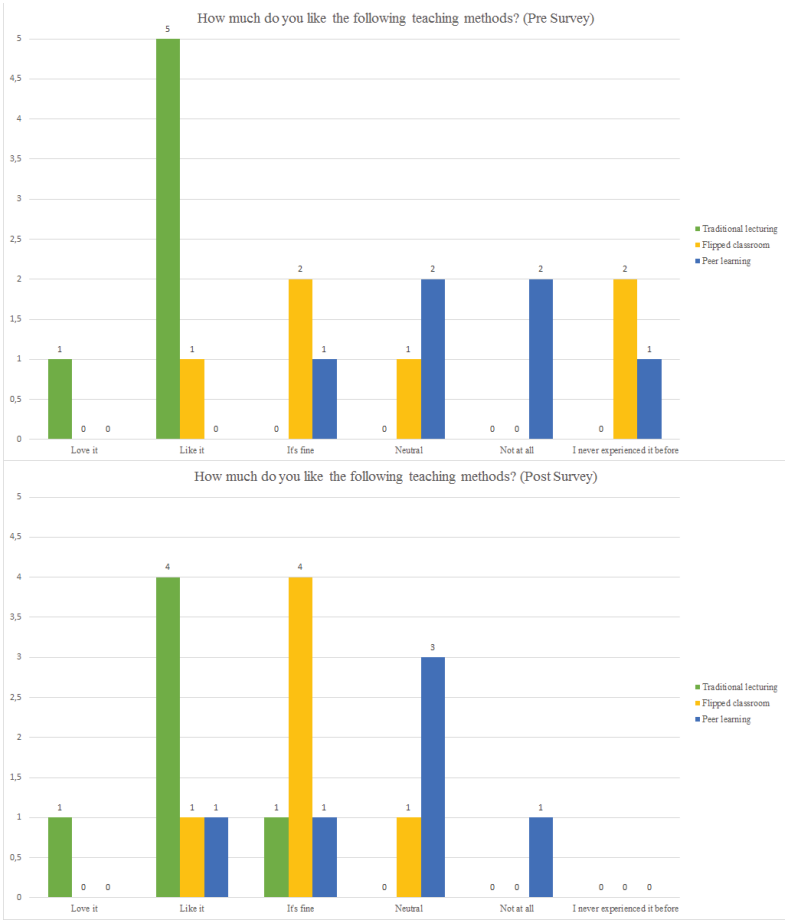


Fig. 9.7. Impact of intervention on attitudes towards different teaching methods.

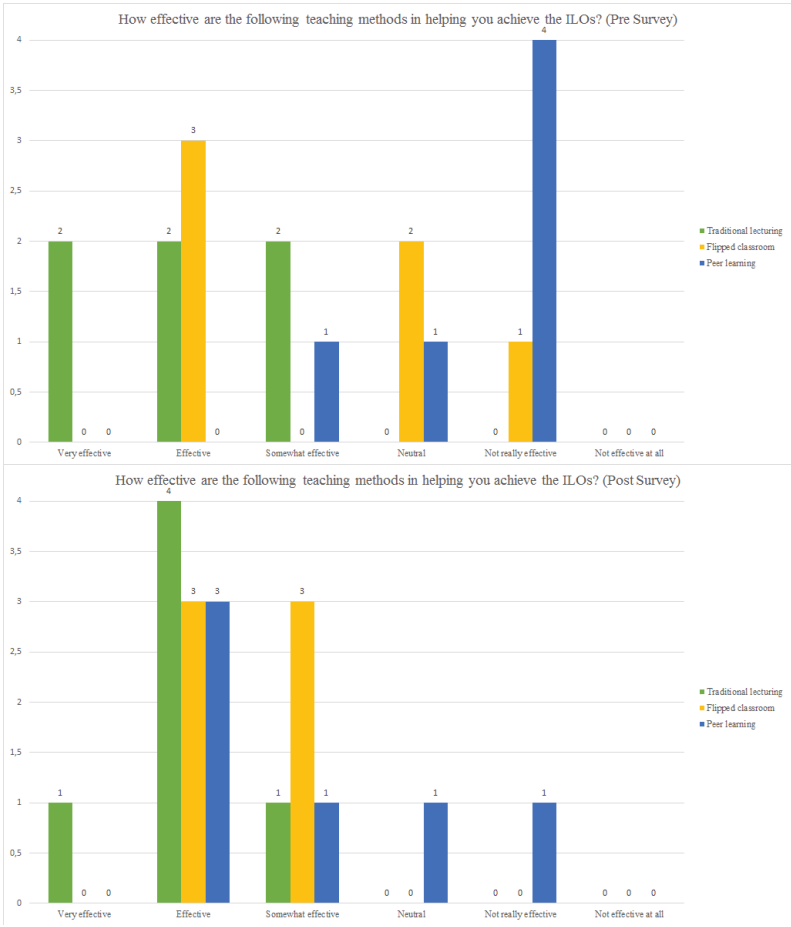


Fig. 9.8. Impact of intervention on perceived effectiveness of different teaching methods.

Conclusions

This project sought to investigate the attitudes of students towards different teaching methods (i.e., traditional lecturing, flipped classroom and peer

learning) and their perceived effectiveness in helping them learn (here specified as achieving the ILOs). At the same time I tried to improve the constructive alignment of the course "Economic efficiency and benchmarking" by introducing 2 flipped classroom lectures and a voluntary peer-review exercise. The impact of this intervention was recorded through a pre-intervention and a post-intervention survey. The results show a positive impact on (i) the attitude towards and perceived effectiveness of peer learning and (ii) the perceived effectiveness of flipped classroom. There has been no real impact for traditional lecturing.

Traditional lecturing is most often used, students generally like it and perceive it as an effective tool for their learning. Students are less used to flipped classroom and peer learning. While flipped classroom is generally perceived as quite effective and students have no negative attitude towards it, results are more mixed for peer learning. This is probably linked to the fact that what students get out of it is very dependent on the cooperation of their peers. Thus, this easily results in mixed experiences.

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A Pre-intervention survey questions

Previous experiences with different teaching methods

The goal of this survey is to learn about your previous experiences with different teaching methods. We also ask about your attitude towards these teaching methods.

In the questions below we refer to different teaching methods which we would describe as follows:

"traditional lecturing" = teaching method where the lecturer presents all the material to the students using e.g., slides or a book. The interaction with students is limited to asking questions or responding to questions of students.

"flipped classroom" = teaching method where delivery of the course material is moved outside the classroom and class time is used to explore topics in greater depth, clarify content and to do practical exercises. This is a form of blended learning.

"peer learning" = teaching method where students learn from their fellow class students in class. This can be organized e.g., by students presenting new material to each other, by discussing material in groups with each other, etc.

*Required

1. **Email address** *

2. **How often have you experienced the following teaching methods in the past?** *
   Mark only one oval per row.

	Never	Only once	Occasionally	Most of the time	Exclusively
Traditional lecturing	◯	◯	◯	◯	◯
Flipped classroom	◯	◯	◯	◯	◯
Peer learning	◯	◯	◯	◯	◯

Attitude towards different teaching methods

3. **How much do you like the following teaching methods?** *
   Mark only one oval per row.

	I never experienced it before	Not at all	Neutral	It's fine	Like it	Love it
Traditional lecturing						
Flipped classroom						
Peer learning						

4. **Please briefly clarify why you feel this way about "traditional lecturing".** *

5. **Please briefly clarify why you feel this way about "flipped classroom".** *

6. **Please briefly clarify why you feel this way about "peer learning".** *

Effectiveness of different teaching methods

7. **How effective do you think the following teaching methods are in helping you achieve the intended learning outcomes of a course?** *
   Please also answer for the teaching methods you have no experience with.
   Mark only one oval per row.

	Not effective at all	Not really effective	Neutral	Somewhat effective	Effective	Very effective
Traditional lecturing						
Flipped classroom						
Peer learning						