## Flipped classroom at the University of Groningen

### Sharing experiences

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August 2015

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Date: 28-08-2015
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1 Introduction

From November 2013 to August 2015 a group of teachers and support staff has been in contact to experiment with and collaborate on the "flipped classroom". This was made possible by funding via e-learning projects. The project described here is named: 'Flipped lecturing en interactief onderwijs'.

The aim of this report is to share experiences from the pilots within the community of the University of Groningen.

For brevity, this report starts with conclusions and recommendations (chapter 2), information leading to these conclusions can be found in subsequent chapters. In this e-learning project five themes were addressed.

Pilots are at the core of the project, providing us with first hand experiments with teachers, and reactions of their students. Evaluations of these pilots are given in chapter 5. We thank these teachers for their courage to stand out from the crowd. Within the pilots, many kinds of interactive exercises are used. Students have published summaries by blogging, answered multiple choice questions, responded through online forums, have posted on twitter walls, answered questions on their phones via Mentimeter, or battled for points by using Kahoot. Examples of these interactions can be seen throughout this report, and are found in the interviews with teachers. Decisions on these interactions are made in designing flipped classrooms (chapter 3). Sharing knowledge, which is done in this report, but was also done on seminars (such as the e-learning seminar on april 9th 2014), workshops and in faculty meetings. To support teachers efficiently, proper tools are needed (chapter 5). Last but not least, video takes a prominent place in flipped classrooms (chapter 6). To support teachers in design and production of flipped classroom videoclips, a manual was developed for teachers who want to record their own video for flipped classrooms (appendix 2).

We hope this report stimulates active forms of learning at the University of Groningen, as seen in flipped classrooms.
2 Conclusions and recommendations

Flipped Classroom is a strong example of the effects an active learning method can have on student’s pass rates and deep learning. It enables teachers, especially when teaching groups larger than 100 students, to interact with students through modern, easily available and often low cost tools/technology. It enables interactive, formative assessment of the student’s level of understanding of the courses subjects. From the teachers who participated in interviews for this evaluation, 4 out of 6 believe that students who attended flipped classrooms and were well prepared, had a better understanding of the material and a deeper learning experience. In three cases an increase in pass rate has been found. This seems consistent with existing research. Large differences were found in pass rates in favor of active learning courses (Freeman, et. al., 2014).

![Graph A](image1.png)  ![Graph B](image2.png)

Research evidence for active learning (Freeman, et. al. 2014).

However, some limitations to this effect have been found in these evaluations. Working with an activating teaching method during lectures is not the norm at our university. Most courses provide lectures that consist of a ‘traditional’ one way approach, where the teacher speaks and the students, passively, listen. When flipped classroom was implemented in a single course of the curriculum, and all other courses were taught in the ‘traditional’ way, students had a hard time switching and adapting to the more active teaching method. Also some students, even when being told explicitly by their teacher, did not realize being well prepared for an active learning method, like flipped classroom, is essential for participation during the lectures. For these reasons some students either underappreciated flipped classroom (disliking it) or misunderstood its purpose. This resulted, for instance, in some students watching video lectures, meant for preparation, but not attending the lecture(s), or students coming to class without having done the preparation. Therefore these students did not benefit from the effects of flipped classroom contrary to the students who did fully participate and prepared for class. Again these findings are consistent with current research (Van Vliet, et.al, 2015).

Because of this effect, it is advisable that activating teaching methods, like flipped classroom, are integrated into our teaching and education on a more structural and overall level, instead of being used only by individual teachers in individual cases. This could change the perception and acceptance of students towards activating teaching methods (they will see it as a ‘normal’ way of teaching) and increase their motivation to fully participate actively during classes, increasing the effect of these methods. Changing our way of teaching is however a big change for many teachers and teaching programmers and can be time consuming at first.

Teachers and programmers have to rethink teaching outcomes, recreate lectures and create materials students use for preparation (short video lectures for example). Therefore we feel the University of Groningen and its faculties should encourage these changes by creating ample time and opportunity for teachers and staff to rethink and redesign both their curriculum and individual courses to a more active teaching style, of which flipped classroom is a very strong example.
3 What is a flipped classroom?

Flipping the classroom occurs when the transfer of theoretical information from teacher to student (‘lecturing’) is taken out of the classroom/lectures and presented as material to study before the lecture. The lecture itself is then used to discuss important questions about the material, and assess the student’s level of understanding. These discussions can take place between teacher and students, but also (and often so in large groups) through peer discussion, where students discuss a question among each other and then provide the teacher their conclusion(s) by answering questions through an online voting tool or back channel (for instance twitter). These answers provide teachers with information which topics students understand well and what they find more difficult, needing more explanation.

One of the pioneers and early adopters of this method is Eric Mazur (Mazur, 1993), who searched for a method to activate his students and help them get a deeper understanding of what they are learning. He found that traditional lecturing quickly leads to passive students, while using peer instruction and the flipped classroom model helped students gain a deeper understanding.

Flipped Classroom requires a high level of participation of students, both in preparation and during class, but also requires a higher level of flexibility from teachers, since most of their lectures will be made up of assessing and addressing student’s needs and level of understanding providing extra support and explanation where needed. There are however many forms of implementing flipped classroom in courses. Some teachers change each lecture to the flipped classroom format while others find it more useful to only run a few of their lectures in a flipped format (“partial flip”), and teach the other lectures in a more traditional way, or even switching from a traditional to a flipped format within the same lecture. Which form of flipped classroom to use depends on the course being taught, what outcomes are required and what fits each teacher best.

In a pilot at the Faculty of Behavioural and Social Sciences Rink Hoekstra tried flipped classroom on two occasions. The first year he flipped all 7 of his lectures. In the second year Rink partially used flipped classroom in his lectures, still using questions and peer discussion as tools. He used both traditional lecturing and flipped classroom during each lecture. The course had a Google+ community to let students discuss questions. Rink followed these discussions and, where needed, provided additional comments or helped students by posting short videos.
4 Flipped Class Design

Designing a flipped classroom is similar to designing a regular course. Course objectives should be aligned with testing, which in turn should be aligned with the methods that are used. The methods lead to the actual planning of course activities. Alignment ensures that the course is useful within the curriculum, and that separate course elements build up to the assessment of the course. The student question: “Do we have to study this for the exam?” is eliminated, as the course objectives fit with the methods, which lead to the assessment. Thus, for design of a flipped class, course objectives, methods and assessment are discussed.

Course objectives
To start with a flipped course, there should be clear (and exciting!) course objectives, and the link of the course to the curriculum must be clear: what do colleague teachers, faculty management and students expect from this course? Students (and colleague staff members) are not used to a flipped classroom format, so it is important to make expectations clear. Students are expected to prepare their work before they visit class.

Methods and planning
Student preparation, feedback, and class activities can be planned by filling in the blocks in the figure below.

Planning teacher and student activities (from the official peer instruction blog, Schell, 2012).

The teacher prepares short video clips and (reading) assignments, which students respond to via the electronic learning environment. Student answers are pushed back to the teacher, who uses these answers to plan their lecture. A teacher can select the most interesting student questions, pick out areas that are not well understood, and skip content areas that students do understand.

Assessment
Assessment can be formative (during) and summative (after the course activities). With flipped classrooms mainly improves formative assessment is improved as students can track their own progress: during the lecture discussions are held, based on guiding questions, students do presentations, work on assignments, and get feedback from the teacher and peers. Voting systems such as Mentimeter, Kahoot, Todaysmeet or Feedbackfruits (see chapter 6) are used to gather responses and

In a pilot at the Faculty of Spatial Sciences (Aleid Brouwer) students prepared for lectures by completing summaries of journal articles. A roster was made for giving feedback on the summaries. Special attention was paid to the guidelines for giving feedback, these were explained and practiced in the first lecture of the course. The photo shows students working on this (timed) assignment within the first 20 minutes of this lecture. Though this method does not seem very innovative (no online videoclips or voting tools were used) it worked very well to engage and activate students. The course pass rate went from 80% to 100%.
quickly get an overview of answers. Crucial here is to design questions that have no single answer, thus require thinking and discussion. These questions should deal with the most important aspects of the course (the “big debates” of the topic area), since they take up (costly) time during lectures. The questions should need entry knowledge, gained from students preparing themselves before the lecture.

The design of courses for a flipped classroom can be supported by professionals, for example via an individual support programme, further the design of flipped classrooms can be integrated into the design competence for the University Teaching Qualification.

In the course “European Law” (Hans Vedder, Lorenzo Squintani), students are asked to view video clips and answer multiple choice questions to test their understanding. The activities during the lecture are planned based on the student responses to the multiple choice questions. This approach can be used with large groups of students (more than 100 students).

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5 Pilot projects at the University of Groningen: teacher experiences

Open ended interviews were carried out with teachers who have experimented with the flipped classroom concept. The interview format, the teachers who participated and a full text of the interview can be found in appendix 1. The interviews, reports of the interviews and this summary were done by Esther Bouma (ES&I). For objectivity, Esther has not participated in the support of teachers for flipped classrooms.

This summary gives an overview of the most important conclusions.

Reasons and experiences

The two most important reasons to participate were:
1. To gather experience with this innovative concept of learning
2. Stimulate students to study the course content before the lectures and be critical thinkers during lectures

The teachers who were interviewed have experienced the pilots as enjoyable and motivating. “It is way more interesting to have discussion with students, and teach them higher order thinking than repeating the contents of the book”. Tricky moments were when a planned activity didn’t work in class. The reason for this was that students didn’t prepare, or were uninterested, but also because some students were afraid to say something that is wrong or silly.

Time investment

The invested time varies widely, from 1 extra hour per lecture to 150 hours (especially for recording videos). Not all teachers made videos themselves, but it is clear that this is the most time consuming aspect of the flipped classroom. Teachers are very happy with the support of ES&I, in the area of educational advice, as well as in practical support (such as making shorter versions of clips and placing materials on Nestor).

Student reactions

Student reactions on the flipped classroom as perceived by lecturers are diverse. Some students are positive but prefer “standard lectures”. 3rd year and Master’s students are more active participants than second year students. Students who didn’t prepare had trouble to keep up during the lecture. Students were in general very positive about the videos. Information was (usually) presented in a very concise format, they know exactly how much time was needed, and they could study in their own time and place. Students were positive about tools such as Kahoot and Mentimeter.

Educational value

In three courses further analysis was done by the lecturers themselves with regards to the relation between the flipped classroom and grades. In these courses, the pass rate and average grade was significantly higher as compared to versions of the course in previous years. Students who participated actively in class, and/or attended the lectures obtained higher grades. The six lectures who were interviewed think that flipped classroom has educational value, and want to continue working with this concept. One teacher indicates: “I think my students have learned more. I don’t just see this in pass grades, but also notice this in discussions. An objective to “participate on a high level in discussions about the course area” is for reached for most students.

Another teacher says: “I can now help my students to develop higher cognitive skills. The book becomes an addition, on which I build. Because of the flipped classroom I make time to work on a higher level during lectures.”
Future of the flipped classroom

Students have trouble to get used to this new, more active, way of working. When flipped classrooms are used in a block or semester, and not within a separate course, they can get used to it more. It is important to brief students about the goals and advantages of the flipped classroom. Teachers and management of the University of Groningen do not have a unified image of what the flipped classroom is. “Flipped classroom is more than watching videos before a lecture.” If the flipped classroom is to have a clear role in university education it should be established what it is, and is not. Despite the fact that most faculty boards find the flipped classroom an interesting development, many teachers are apprehensive to take it up. They doubt the educational value, think it cost much extra time, or don’t know how to redesign their course content. Possibilities for support of flipped classrooms should become more known in faculties.

Teacher tips

- Think about why you want to flip
- Talk to colleagues, and people from ES&I
- Experiment, dare, try!
- Let someone take (a fresh) look over your shoulder
- Extra time investment is earned back in later years
- Evaluate the process to gather evidence of the effects
- Stay true to yourself!
- Use tools such as Mentimeter or Kahoot to test knowledge or poll opinions
- Open a twitter wall to (anonymously) place questions or comments

Tips for making videos

- Make a script in advance
- Make sure that you know the learning objective
- Keep the audience’s attention via meaningful animations/images/texts
- Use a good tool for audio
6 Tools: a comparison of software tools currently used at University of Groningen

We can roughly subdivide tools for flipped classroom in three categories: Student-response systems, tools for recording video and discussion platforms. The tools selected here are mainly selected on ease to use for teachers. Teachers should be able to quickly use these tools from their own work place, be it at home or at the university.

**Student-response systems:**

Most common are Mentimeter, Kahoot and Socrative. All three tools are free to use to a certain extend. All three have in common that they are easy to use, work well on mobile devices and allow you to create a free account and save questions. There some small differences too: Kahoot has the most different look and feel, it is more competition based, and has a more animated look where Mentimeter and Socrative have a more formal look. Kahoot is definitely a good choice if you want to use competition elements in your class. However this comes at a bandwidth price, which means that, the more participants, the higher the bandwidth of your internet connection needs to be. This limitation also applies to Socrative, who do not guarantee success over 50 participants (a 150 will definitely be too much for Socrative). This makes Socrative not very useful for large groups. The plus side of Socrative is that it lets you export voting data for free. This is a payed feature in Mentimeter. This free export is also available in Kahoot. Finally Socrative and Mentimeter allow you to choose different question types (also open questions), where Kahoot does not (Multiple Choice only). All three also have the possibility to not show the answers to students right away, in case peer discussion is wanted in between voting.

Conclusion: To avoid bandwidth issues with large groups (100+) Mentimeter seems the safest bet right now. For about 150 users Kahoot requires about 5-6mbit connection. Mentimeter also has open questions which Kahoot does not. However, if you want to run a competitive quiz, Kahoot is definitely worth figuring out whether the bandwidth is fast enough. Socrative seems too limited for most groups given its small possible group size.

A tool that needs separate mention is Feedback Fruits. Feedback Fruits is a collaboration tool which is currently being tested in pilots at our university. The upside of this tool is that it is a learning environment (possible to be combined with Nestor/Blackboard) which also holds a lecture and voting tool and offers most of the features mentioned in the other tools. However given the cost of Feedback Fruits, the definite implementation has to be decided after piloting within our university.

Kahoot: https://getkahoot.com
Mentimeter: https://www.mentimeter.com
Socrative: www.socrative.com/
Feedback Fruits: https://secure.feedbackfruits.com/
Recording video

For teachers who want to produce their own short videos (for instructions for creating one: see chapter 6 and appendix 1) there are several tools available. At our university we have many teachers using screencast-o-matic. This, simple to use, tool lets you record your video within the web browser, or you can also download the tool (both for Windows and Mac) and run it locally (which is convenient in case you have no Internet). Another well know tool is Camtasia. However, contrary to Screencast-o-matic, this tool does not have a free version. The upside of Camtasia is that it comes with a nice package of editing and animation tools so you can create more professionally looking videos, where Screencast-o-matic only has some basic features which are also only available in a paid version of the program. Furthermore the free version of Screencast-o-matic limits your recordings to a maximum of 15 minutes per video. Both programs allow you to make a screen recording (of your computer screen, so you can record your PowerPoint for instance) and combine this with a video & audio (webcam for instance) of yourself. Both programs make recording very easy to do, which means that you can record new videos quickly, anytime and anywhere.

Conclusion: For teachers who wish to spend more time on editing and creating more professionally looking videos, Camtasia is a very viable option, even with the cost that goes into it. However for most teachers, who wish to record simple video-presentations screencast-o-matic is a great tool. Also the cost to switch to the Pro-version and the ability to use simple editing tools is only 15 USD per account, which is very low.

Camtasia www.techsmith.com/camtasia.html
Screencast-o-matic www.screencast-o-matic.com

Discussion platforms

The use of discussion platforms for flipped classroom is very useful. It can be used to have students post questions on that week’s topics, or send in questions that can be used for the flipped classroom sessions. The most commonly used platform is Nestor/Blackboard. The advantage of Nestor is that it is already being used as electronic learning platform, thus not requiring students to log in to another system. For teachers who are more experienced with Nestor, a great tool to link flipped classroom activities is the Course Organizer. Also available is the use Google Communities or Groups. All students and teachers have a Google account using their university mail. The plus side of this tool is the easy access via Mobile Devices. The downside is that it requires students and teachers to activate a Google+ account with their RUG email and creates an extra platform outside of Nestor. Finally, the previously mentioned Feedback Fruits, holds many opportunities for group discussion and is currently being tested.

Nestor: www.nestor.rug.nl
Google+ example tutorial https://sites.google.com/a/rug.nl/pedokrugstudent/home?pli=1
7 Procedure for flipped video: Teachers recording their own clips

In most flipped classrooms, short video clips are used to help students prepare for interaction in the classroom. These clips convey the main points of the topic at hand, and pose the main questions and dilemma's that students may encounter.

A short manual (Appendix 2) is written to support individual teachers in recording their own clips in a flexible, fast, and low-cost manner. As an example, one teacher described recording video clips as a way of giving feedback to learners. Instead of writing down the feedback, he would record a clip showing how a specific calculation is done. This is a quicker way to work, the teacher speaks out loud as he does the calculation, and doesn’t have to worry about correct wording. With modern tools for recording clips, such as screencast-o-matic.com this can easily be done from the teachers’ workplace or home address, at any time of day.

Video clips for flipped classrooms can also be made via AV services, with higher quality, but also, a more labour intensive approach and more planning necessary. As each AV service already has their own way of working, producing video clips via AV services departments is not covered here. Further, note that video clips to be used in a flipped classroom can be kept private in an individual Nestor course, and do not necessarily have to be used externally, such as videos as produced in MOOCs.

To enable teachers to integrate video clips in the flow of activities of their course a good integration with Nestor is necessary. It should be easy for teachers to upload their own produced videos in the learning environment. This integration is addressed in a different university-wide project.

Figure: two ways of recording video, on the teachers workplace, or via AV services.
8 References


Appendix 1 Interviews with teachers

8.1 Interview questions
1. Wat was voor u de reden om de methode van flipped classroom te gebruiken?
2. Was de hele collegereeks in dit format of één of enkele colleges? In welk studiejaar van het curriculum zat het vak?
3. Hoe was het voor u om dit te doen? Kostte het meer tijd, was het leuk, waar bent u tegenaan gelopen?
4. Hoe was de ondersteuning voor het opzetten van de flipped classroom? Wat ging er goed en wat kan er verbeterd worden?
5. Hoe reageerden de studenten? Deden ze actief mee, waren ze voorbereid voor de colleges? Hoe was de vakevaluatie en was dit anders ten opzicht van andere jaren?
6. Hoe wordt er vanuit de faculteit/opleiding gereageerd op het flipped classroom concept? (denk aan collega’s, opleidingsdirecteur, ph onderwijs)
8. Gaat u in de toekomst weer flipped classrooms organiseren? Waarom?
9. Heeft u tips voor andere docenten die een flipped classroom willen doen?
10. Verdere suggesties of opmerkingen

8.2 Participating teachers
1. Berfu Unal (GMW)
2. Birgit Snijder-Kuipers (Rechten)
3. Rink Hoekstra (GMW)
4. Aleid Brouwer (FRW)
5. Lorenzo Squintani (Rechten)
6. Jeroen van Engen (Talencentrum)

8.3 Full text of interviews
The full text of these interviews can be obtained from Vincent de Boer (v.de.boer@rug.nl) and Koos Winnips (koos.winnips@rug.nl).
Appendix 2: Steps to record short clips for education

Introduction

Many teachers are now recording short clips. They do this for several reasons; to save time in lectures for flipped classrooms, to standardize explanation, to provide a more motivation form of learning, or for representation purposes. Every clip recorded has its own form, but there are similarities:

- Their length does not normally exceed 5 minutes
- They are easy to record
- Recording doesn’t take that much time (relative to “professional” recordings! Recording a clip costs between 5 minutes and multiple days)
- They cover only one topic (this makes reuse of the clip in multiple settings easier)

This guide is intended to help you decide which form to choose when producing clips, and to help you on your way.

Is it already there?

Why produce yourself when it already exists? You may not completely like or agree with the videoclips you find. But have you considered showing a clip of the famous Professor X, then discuss with your students in class why some things in the video are wrong, or why you can use a different approach?

Some starting points to find clips:

TEDEd: the education variant of TEDx

Khan Academy: especially good at Maths and Sciences

Academic Earth: Quality lecture recordings on many topics

iTunesU: a great many weblectures from iTunes

MIT Opencourseware: search for course materials, not just videoclips
Record your own: which form?
When you find there isn’t any material available that you’d like to use, you can choose a form, such as:

- **Your own explanation**: You record your own clip, with you on screen, explaining a particular course topic. For example, this video explaining the [Great Invention of Debt](#). Time needed for this form ranges from a few hours, to a few days. Other examples, from the faculty of Law, are about “Witwassen” and “International Law”.
- **Interview**: To save time, and to help you focus on what is really important you can arrange to be interviewed on the topic you want to talk about. For example in this clip, where teacher Jacqueline van Kruiningen talks about peer-feedback in Blackboard. The recording of this clip was done in 30 minutes. Editing and publishing was done in about 1 hour by a professional crew of 2 persons.
- **Animation**: There are several tools online that can help you to make animation clips. An example would be this clip from CommonCraft on “Wiki’s in plain English”. You can use tools such as Powtoon ([www.powtoon.com](http://www.powtoon.com)) or Videoscribe ([http://www.videoscribe.co/](http://www.videoscribe.co/)) to make animated clips. In general, this costs more time than doing an interview, or recording your own explanation, but results can look quite professional.
- **Let your students do it**: Why should you as a teacher do all this hard work of thinking and planning around your course content when your students could do this? Here’s an example of a student produced clip on [Brainwaves and Mozart](#). With tools such as [http://screencast-o-matic.com/](http://screencast-o-matic.com/), students can record their own clips. You can break up a big course (150 students and more), divide it in groups, and ask the students to produce clips based on parts of the course content. Many teachers are looking for ways to activate learners, and struggle to find ways to do this, especially for large groups. Having students record their own clips could be one of the solutions.
The design and production process

To make short video clips, the steps in the production process are often similar. You can follow these steps (this idea is from this blog):

1. Make a **mind map** of what you wish to explain. This can be done on a piece of paper, or with a mind map program.
2. Make a **sequence** of the different parts you are going to explain.
3. Search for **pictures** on the internet for every part of the sequence. Add some describing words, but not too many. Paste the pictures in a presentation (e.g. PowerPoint). To find pictures go to **flickr.com** or Google and use the advanced search tools there to search for royalty free material. Mention the image’s source on the slide.
4. You can **write out** or check your timing with a script (edited from internal documentation, University of Amsterdam):

<table>
<thead>
<tr>
<th>Central concept of your clip</th>
<th>Scenario to develop understanding</th>
<th>Timing</th>
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<tbody>
<tr>
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<td>I. Introduction: what is the problem, goal of the clip</td>
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<tr>
<td></td>
<td>II. Explanation</td>
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<td>III. Summary – solution</td>
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5. **Make** a video presentation. Here you can use tools such as [http://screencast-o-matic.com/](http://screencast-o-matic.com/). Tell your story with the pictures, speak slowly and use your mouse to point out specific parts.

6. **Redo** the presentation when you are not happy, this is often faster then editing your clip afterwards, as you will start speaking more concisely with practice. Thus, we recommend not to start editing. If you do want to edit, tools such as “Camtasia” can be used. The paid version of Screencast-o-matic supports editing as well.

It could help to check out some more tips and info for speaking without an audience (information is in Dutch).

**More help? AV services**

Several departmenteps at the University offer AV services, and help can be obtained from CIT as well:

- Languages /Law:
  [http://www.rug.nl/rechten-letteren/av-services/](http://www.rug.nl/rechten-letteren/av-services/)

- Economics and Business, the department ECS:

- Centre for Information Technology:

- Behavioural and social sciences, department of Teaching and Research Support:
  [http://www.rug.nl/staff/departments/11533](http://www.rug.nl/staff/departments/11533)

- Medical Sciences, Institute for Medical Education, Teacher support:
  [http://www.rug.nl/staff/departments/17864](http://www.rug.nl/staff/departments/17864)