ScalableLearning

Introduction to Flipped Classroom Teaching

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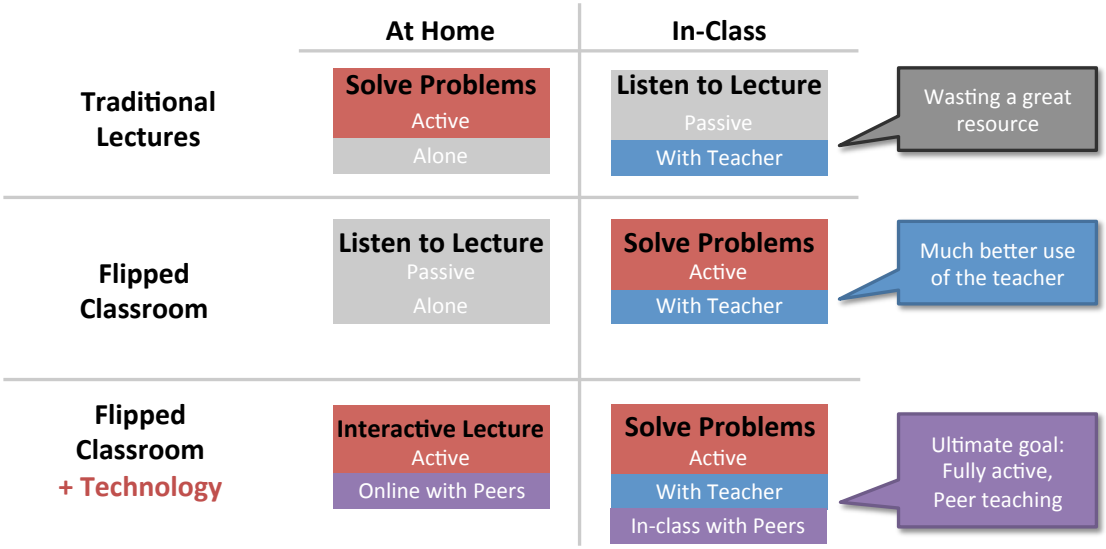
Please send all questions and comments to david.black-schaffer@it.uu.se.

You can read more about the details of using ScalableLearning, including tutorials and tips and tricks in the **ScalableLearning Instruction Manual** available in the Help menu on ScalableLearning.

Active Teaching for Better Learning

Flipping the classroom is all about getting passive lectures out of the class so that students can engage in active learning activities during class time, which challenges them while they are in the classroom with the teacher to help.



There are three major components to Flipped/Just-in-Time/Active teaching:

- **Interactive online lectures**: Move lecture time online and add interactive quiz questions and student reflection.
- **Teacher feedback on class performance**: Use the results of online quizzes and questions to help direct in-class review.
- **Active in-class teaching**: Spend time in the classroom focusing on student-active teaching.

The key focus of flipped teaching is to get the students to spend their in-class time on active learning. To be successful, you need:

- **Prepared students**: Teachers must strike the right balance of grade-based and learning-based incentives to get students to reliably prepare before class.
- **In-class challenges**: In-class activities need to be sufficiently challenging to force students work through the key concepts and discuss them with their peers.
- **In-class structure**: In-class activities must include clear instructions and expectations (e.g., how much time and what to produce) so that students don't get frustrated and don't waste time trying to figure out what to do.
- **Help in the classroom**: In-class activities should be structured such that students spend a significant amount of their time working with other students. This forces them to clarify their own thinking by explaining it to others. Students should also have access to teachers and TAs during the class time for clarification and assistance.

This document gives an overview and tips for how to prepare for flipped teaching including developing in-class problems, putting together interactive online preparation material, and the logistics of how to record your materials for online flipped classroom teaching.

Moving to Flipped Classroom Teaching

Assumptions

1. Your in-class material consist of computer-based presentations with you talking and advancing the presentation.
2. You want to record your computer screen and audio for your online lectures.
3. You want to include online self-assessment quizzes and in-class active learning.

If you're not doing computer presentations…

- If your class is based on on-the-board lectures, you can record them in a similar fashion with a document camera or simply a phone pointing at a well-lit piece of paper. Either setup will record what you write quite adequately.
- If your class is based on textbook reading, you can create videos that direct students to read certain portions of the text, followed by interactive quiz questions in a similar manner to recording computer presentations. This allows you to add interactivity and get feedback from the students' reading preparation.

Basic steps

The first step in flipping your classroom is developing engaging, active in-class activities for your students to do in pairs or small groups. Your online interactive preparation material will then help prepare students before they come to class.

Once you have a good idea of your in-class activities, flipping your classroom by recording your lectures and adding online interactivity consists of four steps:

1. Split your lectures into short segments
2. Develop self-assessment questions for the lectures
3. Record your lectures
4. Put it all together in ScalableLearning

The first time

We strongly encourage teachers to only change a few of their lectures the first time around. This allows them to get experience and feedback from their students before they convert everything. In particular, make sure to develop in-class problems and get some feeling for what kind of in-video quizzes you want to have before you starting recording.

How long does it take?

The most time demanding part is converting your courses to include in-class practice problems and in-video quizzes. The in-video quizzes should be short, but helpful, while the in-class activities should be longer, more challenging, but also more structured. Remember that the real value of flipping your classroom is adding content that makes your courses more interactive, which forces the students to think more, which increases learning.

How much time it takes to record varies enormously from teacher to teacher. The more practice you have the less time it will take. In the end it will take between 10% and 50% longer to record a decent (not perfect) lecture than to give it in class. If you are recording in a language other than your native language it may take more time. Some teachers find it helps to write a script for the first few videos to get them started.

Helping students get the most from flipping

To make flipped teaching effective, **you need to get the students to prepare for class** by actually watching the online content on time. This can be a challenge, particularly for students who have hitherto felt that all aspects of a course were optional. There are several approaches

to this, but the most important thing is to *make sure that the time they spend on the material directly helps them in passing the course*. Our experience has been that once students see that this approach is an effective way to learn the material, they don't complain.

However, getting them to see that this is a helpful way to learn can be a challenge. To reach students the most effective approach is make the online content and in-class problems a required (graded) part of the course. (After all, most students optimize their time for the grade.) However, there are many ways to do this. Two that have worked for us are making in-class attendance and online lectures required (reduced grade for missed lectures) or providing bonus points (increased grade for attending). In the required case, it is important to provide flexibility for students who are sick or have conflicts.

Example 1: Required for Grade

This approach requires students to watch the lectures and come to class as part of their grade, but provides flexibility:

- Students are required to watch the lectures before each class
- Students are required to attend the in-class practice sessions (attendance sheet is passed around in class)
- Failure to do either of the above reduces the participation portion of the grade to a 0.
- However, students are allowed 8 "late days" if they cannot make a deadline. These late days do not extend future deadlines.
- If a late day is used for an in-class practice session, then the students have to turn in written solutions.

This approach gives students flexibility when they need it, but forces the students to participate in the online and in-class activities. This approach also provides a strong incentive for attending the in-class practice sessions in that it is far less work to do the problems with a partner in-class than to do them at home and turn in a written solution. The overhead is keeping track of the late days, although very few students will ever use up all 8.

Example 2: Bonus points on the exam

This approach makes the online lectures and in-class portions of the class optional, but gives students bonus points on the exam if they complete them:

- Students who watched 10/12 of the online lectures on-time receive bonus points on the exam
- Students who attended 5/6 of the in-class meetings receive bonus points on the exam (attendance sheet is passed around in class)

This approach avoids "requiring" students to do any extra work, but gives them a strong incentive to do it. The overhead is in adjusting the final exam grades with the bonus points.

Example 3: Graded review quizzes

This approach makes the online preparation optional, but includes graded review quizzes for each lecture. These quizzes can either be online quizzes or in class:

- For online quizzes, students are allowed two attempts at the quiz. This allows them to try it once without watching the online material, and, if they do well, they can skip the video. However, if they do poorly, they have a strong (grade-based) incentive to watch the video.
- For in-class quizzes, a short, paper-based quiz is handed at the start of the class. If the students have prepared they should easily be able to pass the quiz. If they have not, their grade will suffer.

Step 1. Develop in-class problems for active learning

1. There are many types of these and they vary depending on the type of course you are teaching. Here are some suggestions:
    a. In-class small group problems
        i. Develop 10 minute long problems for students to solve in groups of 2-3
        ii. Each problem should have multiple sub-problems, with each taking 2-5 minutes.
        iii. The idea is that students struggle a bit with sub-problem A, and then you walk the class through the answer to A. This helps them understand how to start on sub-problem B, but forces them to think through what they don't understand first.
        iv. In-class you describe the problem and then let the students start working as you go around the class and help them. When most students have gotten stuck or finished part A you go through the solution with the class and move on to part B.
    b. In-class Discussions
        i. Develop a topics for 10-minute long discussions within small groups
        ii. Start the activity with 2 minutes of individual reflection where students silently write down their own thoughts on the topic. (This is important to help students who may be shyer have something concrete to contribute.)
        iii. Spend the next 5 minutes with the groups discussing the issue and have them generate 2-3 key points at the end.
        iv. Optionally, have neighboring groups exchange their final key point list so groups can see what others concluded
        v. You can then go around the class and ask each group for one key point that they identified.
        vi. Make sure you have prepared a list of what you consider to be the key points so you can show it at the end. This is important to show the students that they were able to both identify the key issues (the ones you had) and come up with their own interesting issues (ones you didn't have).
    c. Problem Based Learning
        i. Develop larger more open-ended problems
        ii. The students then work on different aspects of them in 10 minute chunks
        iii. There are many detailed approaches to "PBL", so please choose your favorite reference for PBL.
    d. Peer Instruction
        i. Give the students a problem/topic and have each student come up with a solution on their own (1 minute). To make this more effective, it is good to have students show their answer choice with a vote. This can be done by holding up a certain number of fingers, using clickers, or having a piece of paper with 1-4 printed on it in large numbers. By forcing them to vote you make them take their decision more seriously and work harder to explain it in the group discussion.
        ii. Then have students discuss their solutions in pairs (2 minutes)
        iii. Then have each individual student choose their final solution (1 minute)
        iv. Finally, discuss the solutions and why students changed their mind with the class.
2. Structuring the in-class time:
    a. Start with a reflection on the online preparation material. For example:
        i. Provide them with a fairly open-ended question about the material
        ii. Give them 2 minutes to write down their individual thoughts

iii. Give them 5 minutes to discuss it with their partners
iv. Spend 5 minutes in class going over your answers and asking different groups for theirs. Make sure you have your own list of the "right" answers and compare what the class came up with to yours in a constructive manner.

b. Spend a limited amount of time reviewing quizzes from the online material and questions students asked online using ScalableLearning's In-Class tool. You want to save as much in-class time for the students working on the material, not listening to you lecturing.
c. Spend the rest of the time with students working on the in-class material, with you periodically stopping the class to conclude each exercise and discuss the key points.
d. Make sure students know how much time they have for each activity and keep track of the time yourself. It's fine to give students more time or end early if you see that it is needed, but let the students know what is happening.

3. Hints about in-class assignments:
   a. They are typically not graded or collected to avoid putting pressure on the students.
   b. You need to keep the class on schedule so students don't feel they are wasting time or being too rushed. (This takes practice so don't feel bad if you are struggling with it the first few times. Do take notes about how much time to allocate for each problem, and use a timer to keep yourself on track.)
   c. You need to be aware that some students will finish far sooner than others. Providing extra "challenge problems" for those students is often appreciated. For example, I put a few old exam problems at the end of each set of in-class problems as challenge problems. Alternatively you can randomly assign student groups to avoid having the best students always working in the same groups.
   d. You (or the students) will find mistakes in your problems. Use these as positive examples of the student's intelligence and admit them and discuss them in-class.
   e. It takes several iterations to get these assignments to be appropriately clear and about the right length.
   f. Provide plenty of room on the handouts for students to write, and remind them that the answers are available to download online (and make sure they are) so they don't race to write down the solutions.

Step 2. Split your online material into 6 minute or shorter segments

1. Each segment should have a logical topic
2. You should add title slides for each segment
3. I recommend doing this in the slide sorter view of your presentation program.
4. This means you only have to re-record short amounts if you make a mistake or need to change something

Typically each section will have no more than 5 slides. You should try hard to keep the videos to at most 6 minutes both avoid boring the students (watching a long uninterrupted video is intensely boring) and to make it easier for you to re-record if you need to change something.

The 6-minute figure comes from a 2013 study by Philip Guo, et. al. ("How Video Production Affects Student Engagement: An Empricical Study of MOOC Videos" in the ACM Conference onf Learning at Scale) in 2014. They found that beyond 6 minutes student engagement dropped off significantly. They recommend the following evidence-based tips:

- **Shorter videos are more engaging**. Keep the segment time to less than 6 minutes. This is the most important recommendation.
- Videos that **switch between the material and the instructor** are more engaging, although this is harder to produce. Don't switch too much as it is distracting.
- A more **personal feel is helpful**. E.g., in an office rather than in a studio.
- Tablet **drawings are more engaging than (static) slides**. The motion and visual flow from animations is very helpful in keeping students engaged. (moving the mouse to point helps a lot; avoid having large amounts of text appear all at once.)
- Recorded classroom lectures do not work as well as purpose-produced short segments.
- **Fast speaking and high enthusiasm from the instructors are important**. (The students can always pause or rewind, so don't worry about speaking too quickly.)
- Lectures and tutorials are different. For lectures the key part is the experience of someone watching it for the first time. For tutorials students navigate through them more, so an overview and clearly visible labels are more important.

Step 3. Develop self-assessment questions for each segment

1. Ideally you want between 10 and 20 1-minute questions for every hour of lecture time
2. You should have at least one question for each lecture segment
3. For each question, you will need to put together an answer, plus:
    a. An explanation of how the correct answer is correct, and,
    b. A short explanation for why each incorrect answer is wrong.
    This is particularly important so students can learn from their mistakes.
4. If you can not come up with a good 1-minute question to test the material in a lecture segment, you should consider:
    a. Should this segment be split up further? (E.g., is there too much/too complex material to test?)
    b. Should this segment be removed? (E.g., is the material untestable, in which case it may not be worth spending time on at all.)
5. There are two main ways to add self-assessment questions to online lectures:
    a. Put the questions into your lecture
        i. This allows you to have them in your presentation
        ii. You record the question along with your presentation material
        iii. You get to introduce them as part of the lecture
        iv. You get to explain the answer as part of the lecture
        v. But, you can't change them without re-recording that part of the lecture
    b. Insert the questions into the lecture after recording
        i. This allows you to change/add questions without re-recording
        ii. You don't get to introduce/explain the question as easily since it isn't part of the presentation
        iii. This approach is ideal if you are using someone else's content and want to add interactive questions to it

Step 4. Record your lectures and add online interactivity

1. You will need a screen capture program, and a place to store your videos online, a microphone, and a quiet room (see Tips and Tricks below)
2. Close your door, and put a sing on the door that you are recording so you aren't disturbed.
3. Switch your screen to an appropriate resolution so you don't record too large videos.
4. Start your presentation software in full screen mode and start your screen recorder.
5. Record each lecture segment.
6. (Edit them if needed.)
7. Upload the videos.
8. Create videos on ScalableLearning with the video URLs.
9. Add your quizzes to the lecture.
10. Enjoy!

For more details on this process please see the ScalableLearning Instruction Manual available under the Help Menu.

Step 5. Teaching with ScalableLearning and Flipped

Once your students have watched your online lectures and answered the questions you can use the information from their answers to help focus your in-class discussion on the material they found most challenging. The ScalableLearning system has built-in support to make this as easy as possible, but as a teacher you need to be careful to not spend too much in-class time on review. (This is surprisingly difficult as most of us love talking in class and have a hard time giving it up.)

1. **Before class: Evaluate Progress**
    - Use ScalableLearning's **Progress view** to review how students answered the quizzes and what questions they posted during the lecture.
        - Respond to student questions online.
          (They will receive emails with your answers and can see them in the videos as well.)
        - Choose which questions and quizzes you want to review in-class.
        - Remember that reviewing a question or quiz will take 2-4 minutes and the goal is to spend most of your class time on active learning activities.
        - Keep in mind that the students have already seen the answers to the quiz questions both when they clicked on the answer and when they continued the video.
2. **In-class: Review Online Material**
    - Have the students reflect on what they learned from the online material, first individually, and then in groups.
    - Spend 5-10 minutes reviewing the most interesting and relevant online quiz results and student questions.
    - Give students positive feedback about their answers and questions:
        - For good questions tell the class that these are great questions.
        - For questions/quiz results that reveal a problem with the quiz or the lecture be honest and tell them that this was your fault and you appreciate their feedback.
        - Once you get used to this kind of feedback it is a lot of fun to come into class knowing the questions and problems ahead of time. Be sure to convey enthusiasm for being able to adapt your teaching to their needs.
3. **In-class: Active learning**
    - This part takes practice, so do not feel bad if it does not go smoothly at first.
    - Be sure to walk around and talk to the students. Look over their shoulders, listen to what they are discussing, and provide helpful and encouraging comments.
    - Tell the students explicitly that it is fine for them to tell you to go away if they want to work on the problem on their own.
    - Give them a few minutes to get started before you go around and offer help.
    - If (when) you see that many students are having similar issues with a question stop the class and help them get through it. Working with the students in this way will very quickly reveal problems with your questions.
    - Watch the time: try to spend about 10 minutes on a typical problem, and don't feel bad about going on if not everyone has got it.
    - Be careful about student groups that use a lot of your time and student groups that never seem to want your help. You need to make a conscious effort to engage the students who don't ask for help and a conscious effort to avoid being monopolized by those who constantly do.

Tips and Tricks

In-class

- A classroom with tables is ideal
- A lecture hall can work very well if you have students sit in every other row so you can go between them. (This requires a room that is twice as large as the number of students you have.)
- Tell students it is okay to tell you to go away if they want to work on your own
- Some students will be intimidated by the teacher and will prefer to talk to TAs instead
- If you use teaching assistants in-class, make sure they understand both how to do the in-class activities and what the key learning insights from each activity are before coming to class! (Walking around with the printed out answers is frustrating for the students and the TAs.)
- Don't wait for students to ask for help:
    - Go around to everyone and look over their shoulders and listen to their conversations, offer advice
    - You will quickly figure out which students are too shy to ask for help, which don't want it, and which take up too much of your time
- Be prepared to shout at the class to stop (it can get very noisy)
- Don't read the activity instructions out loud to the class. Put them up on the projector and read them to yourself (to estimate the time it takes them to read them). Then ask if the students understood before they start.
- Ideally you should have students choose different groups for each class meeting. If you don't do this, the best students will always work together, which leads to an imbalance in when students finish. You can assign random in-class groups from the beginning to avoid this.
- You can record the solutions/discussions to the in-class activities and post them online after the in-class session has finished. This helps students who want to review the solutions after class.
- Provide students with paper copies of the exercises and instructions so they don't have to spend time copying down material in class, and make sure they get to keep them after class.
- Make sure you manage the time so you don't spend too long on any problem. It is very helpful to have the time for each problem displayed on the problems so both the teacher and the students know how much time to allocate.

Online Lectures

- Help students know where to focus their attention:
    - Use animations in your presentations that help students see where to focus their attention and understand the flow of your material.
    - Do not display large amounts of text all at once on a slide. Have text appear as you discuss it so students know where to focus their attention and do not read ahead.
    - Think about the added value of showing some text on a slide and then talking about it vs. having the students read material that includes the discussion.
    - Videos are great for showing graphics and the ability to move allows you to illustrate relationships: use this spatial-temporal nature to emphasize the connections between items rather than just saying them. E.g., instead of explaining how A leads to B because of C, show on the slide A and animate an arrow pointing to B and then add in the reason C above the arrow. With this

animation appearing as you describe it the video will be more memorable and add a new dimension to your description.
    - Use the mouse pointer when you present to point to the relevant parts of the screen. This makes it easier for students to know where to pay attention and makes the lecture seem more personal.
- Always start each lecture segment with a short overview of what you will talk about and where it fits into the bigger picture.
- Don't worry about small mistakes: think of this as a recorded in-class lecture. If you make a small mistake just explain that it was a mistake and keep recording. If you make a big mistake, then consider re-recording it.
- Add a quick reflection survey to the end of each Module. Simple questions like: list one thing you liked in this module and list one thing that could be improved are very helpful feedback to you as a teacher and give the students a chance to reflect on what they just saw. Adding a more general "Do you have any questions or comments?" at the end is also helpful.

Recording

- Be enthusiastic and engaged. Don't try to speak slowly as students can always pause and rewind if they need to. Speaking quickly because you are excited is far better.
- Stare at the screen as you record and try to imagine the students sitting right on the other side. Most teachers find it very awkward recording alone in their office for the first few lectures, so expect that it will take a while to get used to it.
- Try a test recording to make sure the audio is loud enough and there are no echoes from walls.
- Make sure your microphone does not bump or rub into your clothing.
- Do not move around relative to the microphone or your voice will get louder and softer.
- Always review portions of each video to make sure there aren't any technical mistakes (missing sound, background noises, etc.)
- Do not record too large files. You want to set your screen to be about 1280x720 resolution (widescreen) or 1024x768 (normal) when you record to record HD movies. You can do this with your system settings. If you record at higher resolutions you will create enormous files that will just be reduced in size when you post them online.
- Some people like to include videos of themselves in their recordings. This takes more effort and requires that you have good lighting in your recording room and that you look into the camera while recording. I do not recommend it since you will see the students in-class anyway.

Equipment

- Microphone
    - Lavalier/Lapel microphones are best, but new Mac laptops won't detect them unless they have the right plug. You can fix this with a cheap USB audio card or by using a iPhone headset microphone.
    - The RØDE smartLav microphone is another excellent choice.
    - USB microphones will also work.
    - I use the microphone on my iPhone headset, but I need to make sure the cable does not rub against shirt.
- Uploading videos
    - Once you have recorded videos you need to put them on a server. I recommend YouTube, but you can use your own server if you prefer.

  - To use YouTube, you need a google account (either a gmail one or you can create a new one for free).
  - You can mark YouTube videos as "Unlisted" which means no one can find them by searching on YouTube, but anyone who has the URL can view them.
- **Please see the ScalableLearning Instructions Manual under the Help menu for details about recording videos and uploading to YouTube.**

More Information

You can read more about the details of using ScalableLearning, including tutorials and tips and tricks in the **ScalableLearning Instruction Manual** available in the Help menu on ScalableLearning.

If you have any questions, comments, or feedback, please feel free to email me directly at david.black-schaffer@it.uu.se or join in the discussion with other teachers in the ScalableLearning teacher forum from the Help menu.