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The Implementation of Flipped Learning Techniques in Engineering Courses

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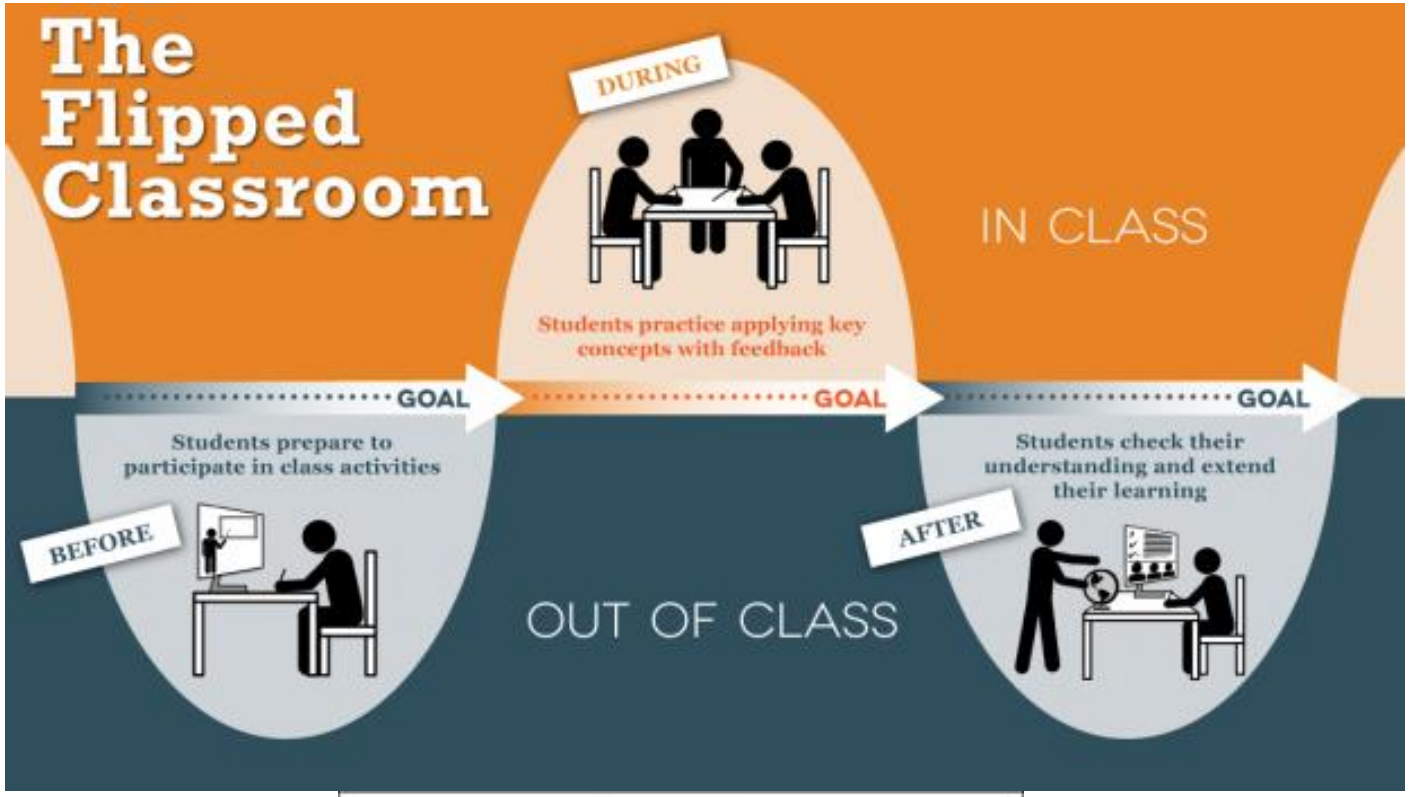
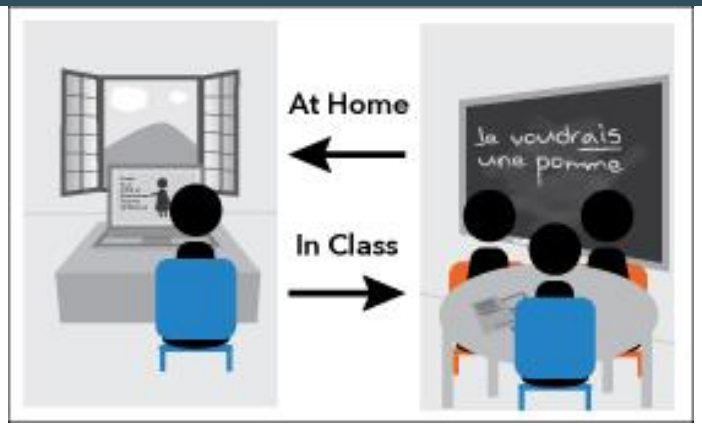
FLIPPED CLASSROOM





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INTRODUCTION TO INDUSTRIAL ENGINEERING

- A course which is not content-wise intensive.
- Every week a different topic.
- Some guest lecturers.
- Every topic that is covered is given by providing only the basic/simple stuff.
- Totally flipped.

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TOTALLY FLIPPED

- Everything that should be covered within the class is given in the videos.
- Tradeoff:
  - Approximately 18-20 minutes long videos.
- The class starts with some applications in Excel (if possible).
- The students who bring their electronic devices followed those applications quickly.
- In-class exercises: 5-10 questions.

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PREPARING THE VIDEOS BY YOURSELF

- Started with Camtasia.
- 1st step: prepare the presentation (15-20 slides).
- 2nd step: write down everything on a paper.
- 3rd step: rehearsal.
- 4th step: shoot the video.
  - If you do any mistake, do not stop. Just repeat what you want to say in the correct way.
- 5th step: edit the video (takes too much time).

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PROS & CONS

time flexibility

comfortable

editing

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PREPARING THE VIDEOS IN STUDIO

- 1st step: prepare the presentation (15-20 slides)
  - Slides become more crowded.
- 2nd step: add notes to your presentation.
- 3rd step: rehearsal.
  - Tradeoff between long rehearsal & spent time in the studio.
  - Solution: a prompter.
- 4th step: go to the studio.

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PROS & CONS


getting rid of editing


looks more professional


shorter video shooting time


no time flexibility


not comfortable


more nervous at the beginning

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COURSE MATERIAL

1. Video presentations
2. In-class exercises
3. Excel exercises (if any)

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IN-CLASS ACTIVITIES

- In-class activities mainly consist of exercises related to the video.
- Groups of students of varying size.
- 1st year: randomly determining the groups & assigning group leaders every week.
  - did not work!
- 2nd year: students determined their groups (of varying sizes).
- 1st year: 10 students → only lecturer is me.
- 2nd year: 2 sections, each with 30 students → get help from a teaching assistant.
- Recommendations:
  - if the no. of students in your class is greater than 20, get help from teaching and/or student assistants.
  - make sure that every student stays in his/her assigned section.
- If the exercises are not finished by most of the groups, continue in the next class.

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STUDENT ENGAGEMENT

- 1st year:
  - ✓ Optional quizzes on Blackboard → bonus points.
  - ✓ Paid attention to each student's in-class activity.
- 2nd year:
  - ✓ Video presentations uploaded just before the midterm & final exams.
  - ✓ 10% participation.
- Next year:
  - ✓ 15% participation.
  - ✓ Active videos.
  - ✓ 2 successful students from the 2nd year = student assistants for the next year.

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SHOW THEM HOW TO WATCH THE VIDEO IN THE FIRST LECTURE.

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OPERATIONS RESEARCH I COURSE

- One of the most important courses in Industrial Engineering.
- 6 ECTS course taught in Spring semester
- 3 hours per week
- 4 quizzes + 1 midterm exam + 1 mini-project + 1 final exam
- No participation grade needed

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COURSE MATERIAL

1. Videos
2. Lecture presentations
3. Textbook
4. In-class exercises

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RECOMMENDATIONS FOR VIDEOS

- Started to get prepared in Fall.
- Prepare approximately 10 slides with large font size & good quality pictures.
- Shoot independent videos:
  - Every video covers only one topic.
  - Do not refer to other videos.
  - No time related phrases.
- Try to divide the videos if they take more than 10-15 minutes.
- Try to give a summary or an introduction in the videos.
- Be careful with the copyright issues.
- How to start & end the video?

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RECOMMENDATIONS FOR LECTURE PRESENTATIONS & TEXTBOOK

- Find a textbook with well-prepared presentations.
- Enlarge the video slides or at least include some of them in the lecture presentations.
- Try to give everything in the lecture presentations.
- Make the presentations available before the class.
- Encourage the students to take their notes on the slides.
- Encourage the students to use the textbook.

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RECOMMENDATIONS FOR IN-CLASS EXERCISES

- Prepare 3-5 in-class exercises.
- At least one straightforward exercise, the rest more complicated & instructive.
- Teaching and/or student assistants needed for large classes.

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TIME ALLOCATION OF DIFFERENT ACTIVITIES

- Before class: make the video available.
- In-class:
  - one day only lecture: students more passive, try to engage them with asking questions.
  - one day only exercises: students totally active.
- After-class:
  - try to finish the exercises within a time limit (at most 2 days).
  - else they finish them at home & check the solutions with me within the class or in my office.

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COMPUTATIONAL METHODS FOR IE

- A freshman course with 6 ECTS.
- This year the content changed.
- Spreadsheet-Based Decision Support Systems.
- Divided into two parts: 1) Excel, 2) VBA
- 3 hours per week.
- All lectures in computer laboratory.
- 1 midterm exam (in lab) + 1 assignment + 1 term project + 1 final exam (in lab).

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COURSE MATERIAL

1. Videos
2. Lecture presentations
3. Textbook
4. In-class exercises

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ACTIVITIES

- Videos made available before the class → Youtube links on Blackboard.
- Give 20-30 minutes presentation on the topic.
- Make presentation related exercises with the students.
- In-class exercises where they work individually or in groups of 2-3. Help: 2 teaching assistants + me
  - Part I (Excel): 3-6 exercises
  - Part II (VBA): 1-2 exercises
- Out-of-class activity: students finish their codes in VBA.
- Recommendation: grade those exercises.

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ANY QUESTIONS?

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