Flipping university courses
opportunities and challenges

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Strengthening Teaching Competences
in Higher Education
in Natural and Mathematical Sciences

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Flipped classrooms

Flipped classrooms are a form of blended learning.

Goal is to
◦ increase student engagement
◦ stimulate successful learning

through

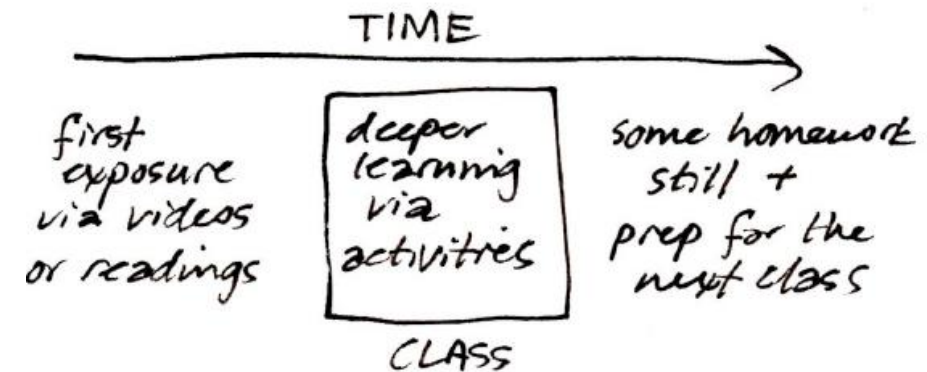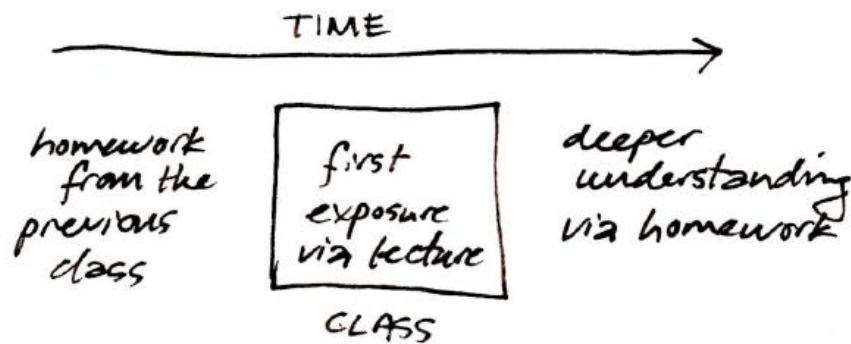◦ a particular model of using technology and applying active learning in the teaching process.

In the flipped classroom, instructors typically assign recorded video lectures (or some other form of introducing concept) as homework, and use class time for active learning exercises and direct engagement with students.

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Flipped vs. traditional classroom

Students acquire knowledge in a classroom context and are then sent away to synthesise analyse and evaluate this after the class

Students acquire knowledge before the class and use classroom time to practice and apply concepts and ideas through interaction with peers and teachers. After the class students reflect upon the feedback they have received in class and use this to further their learning.

Traditional classroom

TIME

homework from the previous class

first exposure via lecture

deeper understanding via homework

CLASS

Flipped classroom

TIME

first exposure via videos or readings

deeper learning via activities

some homework still + prep for the next class

CLASS

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The Four Pillars of F-L-I-P

Flexible Learning Environment: Providing fluid timelines for student work and comprehension. Teachers should adjust to the pace of their students in the class.
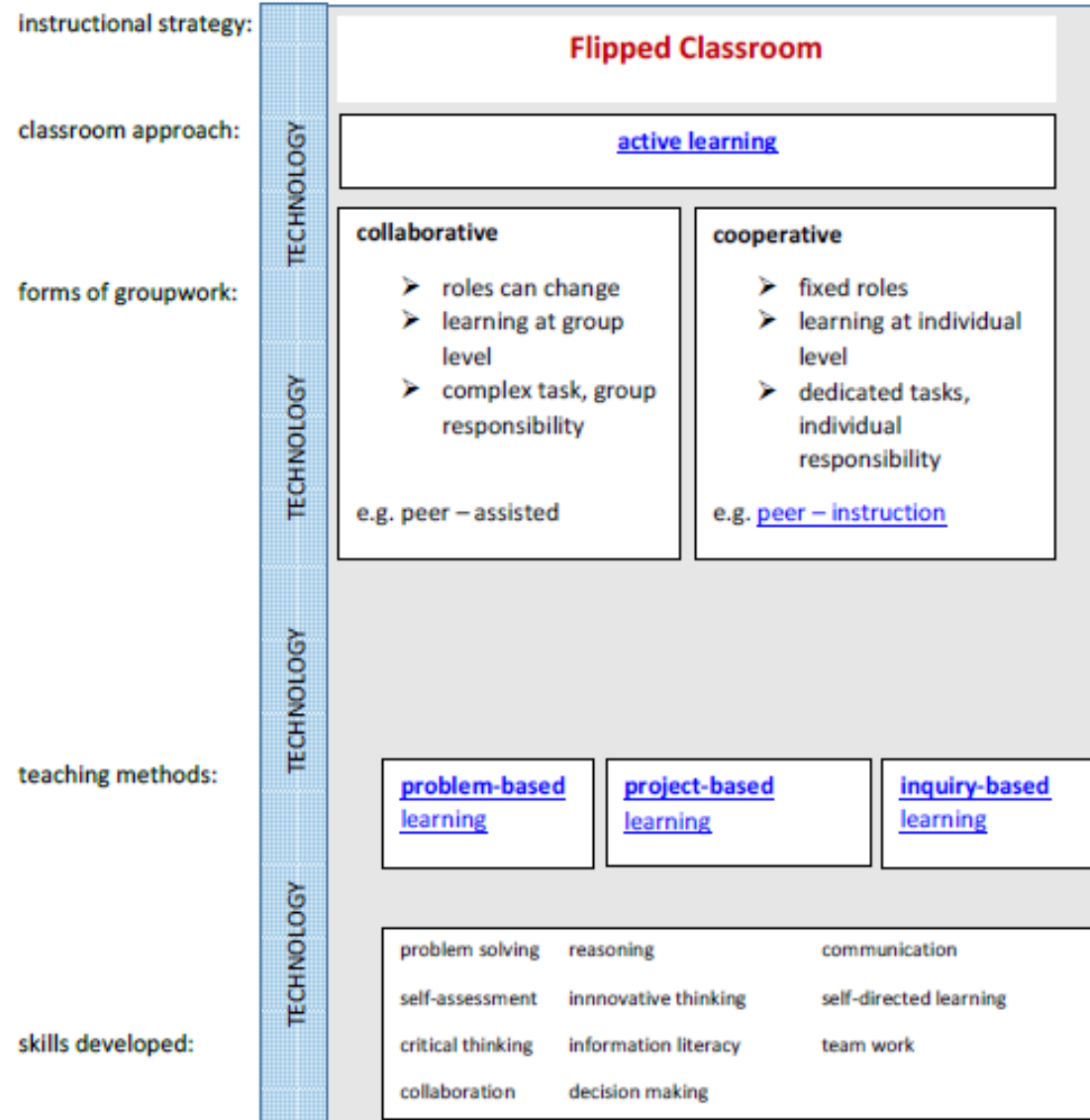
Learning Culture: A rich environment that allows students to delve further into topics and provides them with opportunities for self-reflection and hands-on activities.

Intentional Content: Teachers decide ahead of time what direct instruction to pair with in-class activities. Students should feel challenged but able to understand the material on their own.
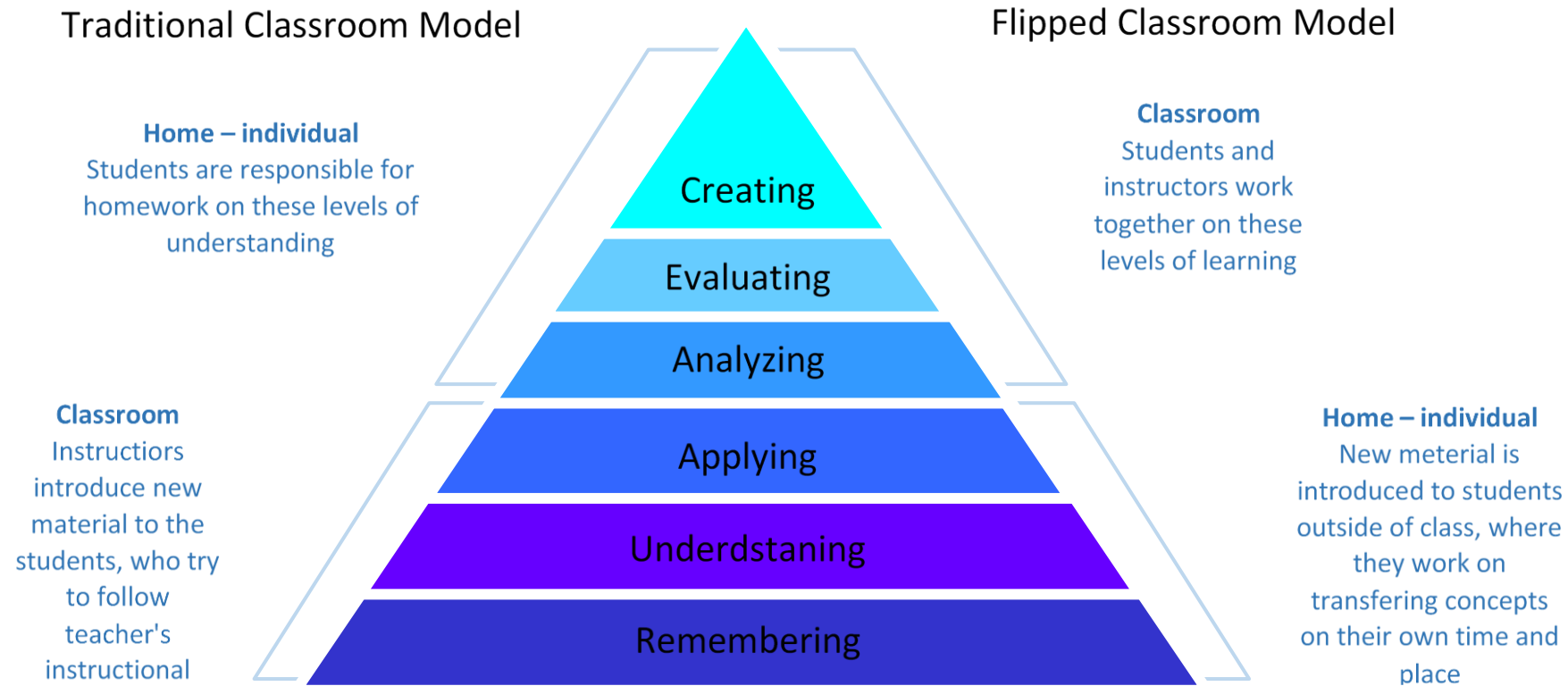
Professional Educator: Teachers monitor students during lessons and offer feedback to ensure no gaps in student knowledge.

Basic flipping steps

1. Give students an opportunity to gain first exposure to lectures before class
   ◦ Recording lectures, breaking them into **smaller conceptual chunks**.

2. Provide proper incentives for students to prepare for class
   ◦ Ensure that students are prepared for the subsequent in-class activities by **pairing lecture video with autograded assessments**

3. Facilitate engaged-learning activities in the classroom
   ◦ Possible activities include small-group problem solving, extensions, applications, and peer feedback.

4. Create opportunities for student feedback
   ◦ Use student feedback and assessment performance to calibrate in-class activities.

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instructional strategy:

Flipped Classroom

classroom approach:

active learning

TECHNOLOGY

forms of groupwork:

collaborative

➢ roles can change
➢ learning at group level
➢ complex task, group responsibility

e.g. peer – assisted

cooperative

➢ fixed roles
➢ learning at individual level
➢ dedicated tasks, individual responsibility

e.g. peer – instruction

TECHNOLOGY

teaching methods:

| **problem-based learning** | **project-based learning** | **inquiry-based learning** |

TECHNOLOGY

skills developed:

problem solving	reasoning	communication
self-assessment	innnovative thinking	self-directed learning
critical thinking	information literacy	team work
collaboration	decision making	

Bloom's taxonomy

Traditional Classroom Model

Flipped Classroom Model

Home – individual
Students are responsible for homework on these levels of understanding

Classroom
Instructiors introduce new material to the students, who try to follow teacher's instructional

Classroom
Students and instructors work together on these levels of learning

Home – individual
New meterial is introduced to students outside of class, where they work on transfering concepts on their own time and place

Creating

Evaluating

Analyzing

Applying

Underdstaning

Remembering

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Effective active learning activities

▪ Applications/extensions – ask students to use what they've learned to solve problems (pick some other use case from real life)

▪ Sequence of Questions - complex problems are broken into smaller parts and then solved systematically with the students (example: Mathematical proofs)

▪ Experiential learning - can take a number of forms, including role-playing, experimentation demonstrations, trips, labs, computer simulations, competitions, debates.

▪ Discussion activities

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Collaborative learning

▪ Small-group problem solving activities are some of the most popular uses of in-class time.

> After breaking up the class into small groups, the instructor can present any number of problem-solving activities (many of which could be modified versions of the aforementioned engaged learning activities) for the groups to tackle. While students are working, the professor and his/her TAs can visit each of the groups, guide the conversation, help the groups that are struggling, and further challenge those that are not.

▪ In peer feedback activities, students participate in the process of evaluating their peers. This turns every stage of the assessment process into a learning opportunity, from completing the assignment to evaluating the work of others. A study conducted by Atay and Kurt (2007) revealed that peer feedback activities can increase student self-confidence, build social affective strategies, and allow for deeper engagement with the course material.

- ▪ One common peer feedback process is comprised of three stages:
  - ▪ 1. Assignment/rubric design: Creating the assignment and corresponding rubric
  - ▪ 2. Content creation: Allowing students to complete the assignment
  - ▪ 3. Peer assessments: Facilitating a peer assessment activity between peers or groups of peers in the class

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The golden Rules of Flipping

- The in-class activities involve a significant amount of quizzing, problem solving and other active learning activities, forcing students to retrieve, apply, and/or extend the material learned outside of class. These activities are often slightly easier than those tackled outside of class, and are directly relevant to the out-of-class work.

- Students are heavily incentivized through grading, in-class activities, and instructor expectations to complete out-of-class work and attend in-person meetings.

- The in-class learning environments are highly structured (often planned down to the minute).

Challenges in the flipping classroom

Implementing the flipped classroom model requires the teacher to sufficiently master the needed technologies.

The teacher must spend more time in preparing and organizing the entire process of activities.

- It is not easy to inspect whether student has studied/acquired all pre-class material.
- In-class activities are not relevant to out-of-class lectures
- Classroom space is not conducive to flipping

Not all students have equal access to online materials.

It is not an easy task to motivate students towards autonomous learning.

- Students aren't completing work assigned for outside of class
- Professors don't "sell" the flipped classroom.
- Students don't show up for lecture

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Challenges in the flipping classroom

Instructors assign students too much work / Instructors don't realize the amount of preparation necessary for in-class activities

For some of them individual student work outside the class is the same as homework not many are fond of. In addition, if the teacher does not properly anticipate the time needed for students to complete the task, and if at the same time an increased number of teachers also apply the flipped classroom model, student workload may easily be excessive.

Also, it is expected that the assessment, mostly formative, is varied and more frequent.

- Professors don't put in place mechanisms to collect metrics for feedback

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Why to flip

Flipping speaks the language of today's students

Flipping helps busy students

Flipping helps struggling students

Flipping allows students to pause and rewind their teacher

Flipping increases student–teacher interaction

Flipping allows teachers to know their students better

Flipping increases student–student interaction

Flipping changes classroom management

Flipping makes your class transparent

Flipping university courses
opportunities and challenges

TRAINING

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