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Challenges of Flipping a Course in Geomatics Engineering

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BACKGROUND AND OBJECTIVES

- Many engineering undergraduate and graduate courses are offered now as flipped courses.
- Is the “flipped classroom” model really a new thing in teaching and learning?
- Observed resistance among the engineering students against active learning methods
  - What can be done to decrease the resistance and increase student motivation?
- **If flipping an entire course is a risky undertaking, can we flip only one course component?**

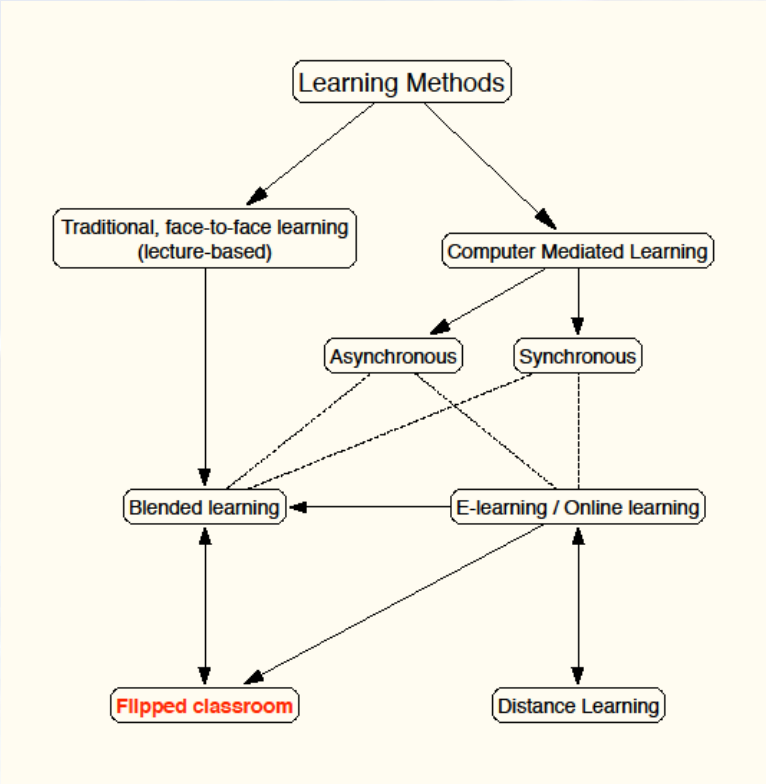
KEY ASPECTS OF THE FLIPPED CLASSROOM MODEL (1/3)

"…. a pedagogical model, in which the lecture and homework elements of a course are reversed" (Faculty Focus, 2015):

- **inverted learning environment = blended learning** (Jamieson *et al*., 2015)
- **individual learning activities**: video-recorded lectures assigned as homework, assigned readings, reviewing key concepts, gathering background information, and completing self-assessments, among others
- **face-to-face class time**: high-level and collaborative activities such as applying concepts, problem-solving, discussions, interpretations, analyses, design and project work, among others

KEY ASPECTS OF THE FLIPPED CLASSROOM MODEL (2/3)

Learning methods classified by the use of a computer-mediated environment



KEY ASPECTS OF THE FLIPPED CLASSROOM MODEL (3/3)

A second definition of the flipped classroom model focuses on the strong link with the student-centered (active) learning methods:

- **main advantage**: focus is on learners
- **active face-to-face interactions**: enriched student classroom experience in collaborative, synchronous and hands-on group activities
- **shared expertise**: method suitable for engineering project-based and design courses
- **student motivation**: a key factor for the success of the “flipped classroom” model

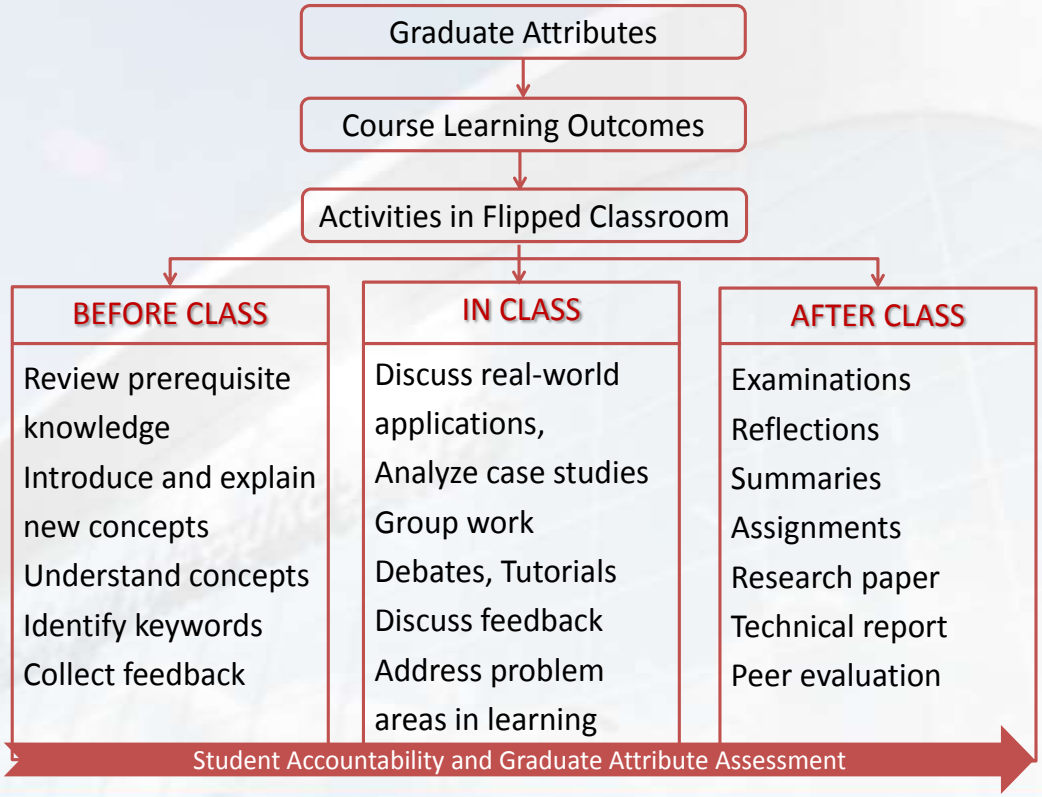
LEARNING ACTIVITIES IN A FLIPPED CLASSROOM (1/2)

Learning activities in a flipped classroom - within the framework provided by the engineering graduate attributes (Engineers Canada, 2016) and course learning outcomes.

Three learning phases according to Bloom's revised taxonomy:

LEARNING ACTIVITIES IN A FLIPPED CLASSROOM (2/2)

Activities in the flipped classroom model (modelled after University of Adelaide, 2017)



GEOMATICS ENGINEERING EXAMPLES (1/3)

Geomatics engineering courses can span the entire range with respect to the content load and hands-on learning.

Content heavy ››› ..... ››› **Hands-on heavy**

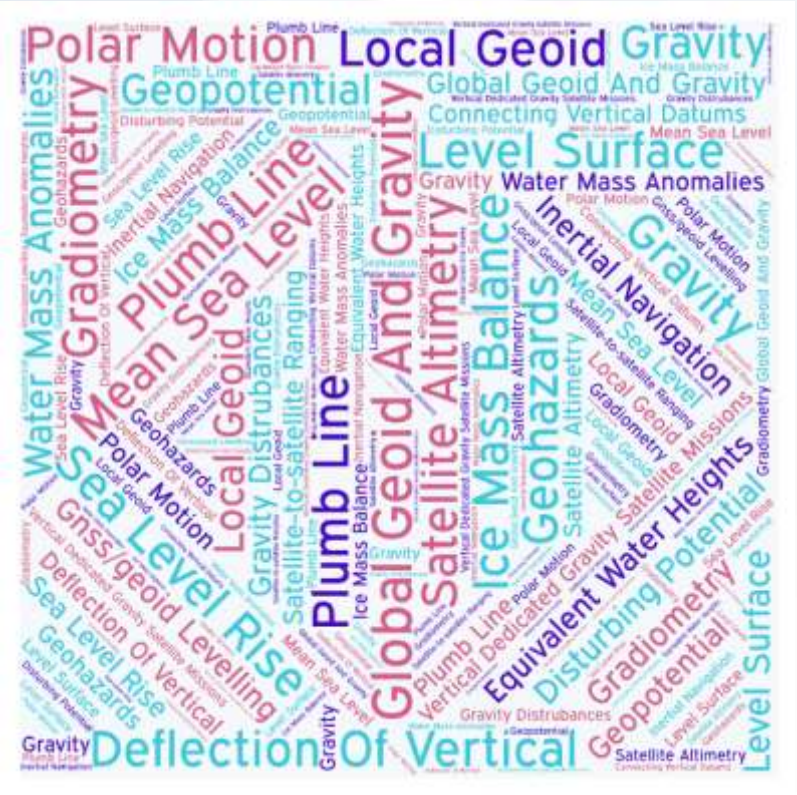
Least-squares estimation
Land tenure and cadastral systems
Geomatics networks
Photogrammetry
Coordinate systems
Geodesy

Field surveys (survey camps)
High-precision surveys
Geomatics engineering (capstone) project
Land use planning
Survey law
Geodetic and engineering surveys

GEOMATICS ENGINEERING EXAMPLES (2/3)

GEODESY

- **before-class** activities
  - watch selected videos on gravity topics
  - identify keywords to search for information on gravity-related engineering applications
  - write a short essay (*accountability*)
- **in-class** activities
  - discuss and analyse selected examples
  - illustrate key concepts in lectures
- **after-class** activities
  - group work on a research question (*accountability*)



GEOMATICS ENGINEERING EXAMPLES (3/3)

GEODETIC AND ENGINEERING SURVEYS

- **before-class** activities
  - review prerequisite survey concepts
  - find standards and relevant information
  - understand new concepts and procedures
- **in-class** activities (lectures and tutorials)
  - analyse new concepts in class
  - test new procedures in tutorials (*accountability*)
  - analyse and compare outcomes
- **after-class** activities
  - design and plan a survey project, project specifications and quality control procedures
  - modify survey procedures to meet designed specifications
  - evaluate individual and teamwork (*accountability*)

CONCLUSIONS

- The “flipped classroom” combines the main advantages of online and face-to-face teaching and learning:
  - “before-class” time-flexible, independent and individual learning
  - “in-class” collaborative and deep learning
- Requires careful planning of learning activities and student assessment and accountability (can mitigate student resistance)
- One course component can be flipped at a time to enhance student learning and enrich the classroom experience.