

Lecture  Problems

Flipping the Classroom in Physics I

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What is a flipped classroom?

	In-class activities	Out-of-class activities
Traditional	Lecture, examples	Homework, practice problems
Flipped	Problem-solving, activities, and demonstrations	Video lectures, simple examples

Rationale for project

Flipping the classroom plays to our students' strengths and neutralizes their weaknesses:

Strengths

- Note-taking
- Memorization
- Motivation to study

Weaknesses

- Independent problem-solving
- Frustration management

Flipped Classroom Advantages

- Students watch lectures and take notes at their own pace
- No lecture time constraints, so more MCAT material can be covered
- Conceptual practice and problem solving happen within peer groups under an expert's supervision

Research says...

- It's no worse than a traditional lecture
- Appears to increase student engagement
- Encourages knowledge application beyond surface learning
- Helps detect and correct errors in thinking
- Out-of-class portion needs to have formative feedback and be linked to classroom activities

The use of flipped classrooms in higher education: A scoping review. Jacqueline O'Flaherty, Craig Phillips, *Internet and Higher Education* 25 (2015) 85–95

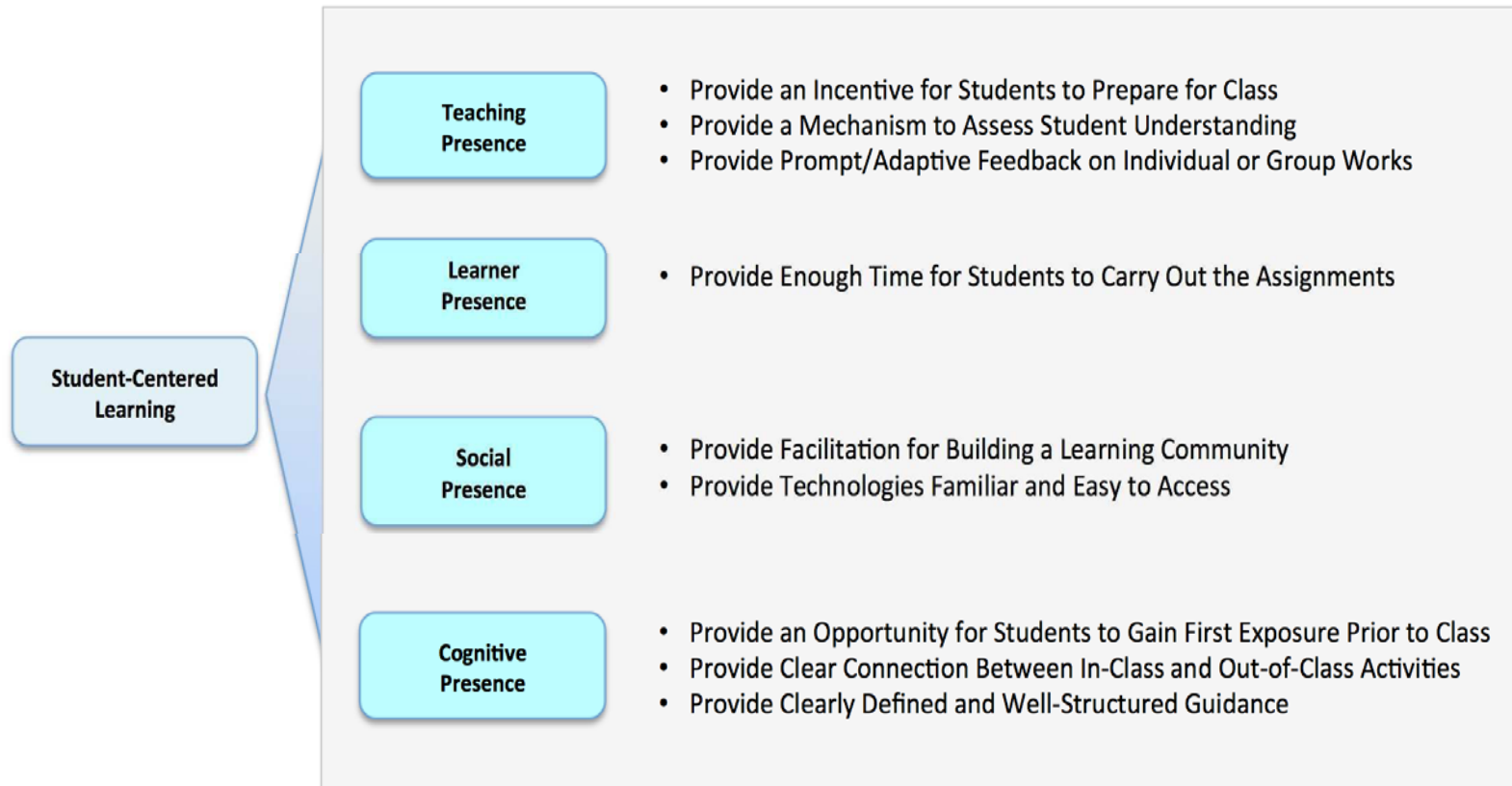
Identified 28 papers addressing various aspects of flipped classrooms, most relevantly:

- What are the educational outcomes arising from a flipped class?
- What is known about the conceptual framework used to design a flipped class?

Gaps in research:

- Specific framework for design of a course
 - “For example, students are less likely to engage in pre-class activities that lack interactivity, fail to provide formative feedback mechanisms and are/or not coherently linked to the F2F class. Equally, there needs to be a balance between pre-class preparatory activities and time spent with actual F2F work”
- Longitudinal studies
 - Length of knowledge retention
 - Entire sequence of courses being flipped

Nine Design Principles



Kim, M.K., Kim, S.M., Khera, O. & Getman, J., The Experience of Three Flipped Classrooms in an Urban University: An Exploration of Design Principles, *The Internet and Higher Education* (2014), doi: 10.1016/j.iheduc.2014.04.003

My format plan:

Before class:

- Reading quiz
- Video lecture with embedded questions
- Note-taking worksheet
- Simple practice problems

In class:

- Activities
- High level problem solving

Lecture Resources:

- Physics - flippingphysics.com, Khan Academy, Crash Course, SCALE-UP
- Math – [TED talk by Dan Meyer](#)
 - Present the visual and the problem. Don't put out the measurements/steps until some discussion has happened. Patient problem solving. "The math serves the conversation, the conversation doesn't serve the math"
 - Einstein quote at 6:40: "The mere formulation of a problem is far more often essential than its solution, which may be merely a matter of mathematical or experimental skill."
- Everybody – Knowmia, WatchKnowLearn

Tools:

- CAT has a recording room, with video editing software
- [Edpuzzle.com](https://edpuzzle.com) allows you to edit existing videos

Implementation timeline

Fall 2017: Test drive flipping the classroom for one subject on each of the four tests. A flipped module will contain:

- Reading quiz on Webassign
- Video lecture and assisting material with low-stakes assessment
- Simple examples and practice problems (videos and existing practice problems)
- Blackboard discussion board for concepts

- In class activity focusing on higher-level conceptual understanding and critical-thinking
- Higher-level problem-solving
- Mini-lecture if necessary
- Exit question

Evaluation

- Compare assessments between sections
- Surveys for student engagement
- Compare total retention rate to history
- Disseminate to other instructors
- Upload content to COMPADRE