Flipping Classrooms to Prepare Future Engineers of the New Century

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A research study of the implementation of new problem-centered collaborative learning designed to enhance learning in an Electric Energy System curriculum has been conducted in partnership with the Department of Electric and Computer Engineering at the University of Minnesota Twin Cities. The innovative instructional strategies of flipping classrooms for widespread dissemination in STEM Education is to:

- Foster inclusive learning
- Facilitate problem-solving
- Promote teamwork

Findings

- Establish a pedagogical model to best support learning in flipped classrooms
- Understand how students learn through classroom Discourse analysis: saying, doing, and being
- Build an inclusive learning community to sustain innovative instruction models

Project Objectives

Results and Impact

Four-Practice Instruction Model for Quality Teaching in Flipped Classrooms

Anticipating
- Problematizing content
- Analyze students’ learning demands

Monitoring
- Giving students authority
- probe students’ responses; engage in conversations with students; keep group discussions on track

Connecting and Contrasting
- hold students accountable to others and to disciplinary norms.
- Elect questions and promote dialogic inquiries; make connections or contrast students’ views to the discipline norms.

Contextualized Lecturing
- Provide relevant resources
- Present lecture based on students’ responses

What did students say about the class?

"--- I will admit that I feel that what I have learned from this class will be retained much longer than what I have learned in other classes." This method of teaching seems to give me more of a 'common sense' approach to solving problems.

"I really enjoyed it. I feel like this class added a lot of the unique value and experiences."

"It really felt like an "engineering" class when I am able to immediately apply my knowledge."

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Publications

Lin et al., “A Pedagogical Model For Quality Teaching in “Flipped Engineering Classrooms”, IEEE Transactions, Engineering Education (submitted);
Lin et al., “Testing Instructional Approaches for Problem-Centered Learning”, 2016 ASEE (submitted);