Workshop Proposal - ASEE Midwest Section Conference 2018

1. Title

Flipped Instruction and Active Learning in Engineering Classrooms with Free Web Tools and Services.

2. Presenters:

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4. Learning Objectives:

The workshop is designed to provide a hands on introduction to the participants on freely available web tools and resources for flipped instruction and active student learning. It is intended to achieve the following specific learning objectives:

- ✓ Develop an understanding of flipped instruction for to enhance student learning outcomes.
- ✓ Understand the TPACK (Technological Pedagogical Content Knowledge) Model relating technology, content and pedagogy in the context of use of educational technology to support teaching and learning.
- ✓ Become familiar with the use of freely available web tools and resources to flip instruction and engage students through 'Active Learning'.
- ✓ Understand approaches to investigate impact of flipped instruction on student learning outcomes and self-efficacy through data collection and analysis.

5. Target Audience:

This workshop is designed to appeal to a diverse group of participants. These include educators, researchers, administrators, policy-makers, students, and parents from the K-20 community. The workshop will be specially beneficial for attendees who would like to develop an understanding and hands on knowledge of freely available web tools and resources to employ flipped instruction in their classrooms and engage students through 'Active Learning'.

6. Overview

The lecture-based teaching strategy (LB) has been used for decades as an effective way to help students acquire new knowledge [1-2]. Many educators argue that this teaching model is mostly static, passive and not suitable for students. For students, the information delivered during lectures may come too slowly or cover what they already know; other students have trouble taking in information so rapidly, or they may lack the prior knowledge needed to understand the presented content [3].

Flipped or inverted instruction approach has recently evolved as a teaching strategy that involves moving the lecture content before class and working on homework and hands-on activities during class time. In the flipped teaching strategy (FB), educators can employ online asynchronous educational video, recorded lectures or readings and spend time in class working on problems or 'active learning' exercises through group-based activities. The learning materials can incorporate multimedia visual representations, such as interactive graphs, photos or animation. During watching the video, lectures or reading the text, students have the chance to control the pace of multimedia streaming to match their own learning preferences. Students can also watch or listen to recordings of class lectures on their computers, tablets, smart phones, or personal media players outside of class, leaving class time to engage in learning activities that might otherwise be assigned as homework [4].

Teaching is a complicated practice that requires expertise in many kinds of specialized knowledge. As an ill-structured discipline, teaching requires application of complex knowledge structures across different cases and contexts that requires constant evolution. Effective teaching depends on access to rich, well-organized and integrated knowledge from different domains that include knowledge of student thinking and learning (pedagogy), knowledge of subject matter (content), and knowledge of technology [5]. These challenges raise an important research question: how can teachers integrate technology into their classrooms? To answer this question, an approach is needed that treats teaching as an interaction between teachers' knowledge and its application to unique circumstances or contexts within their classrooms. As highlighted before, good teaching depends on three core components: content, pedagogy, and technology, plus the knowledge of the interaction between them. Understanding the interactions between and among the three components across diverse contexts forms the core of the technology, pedagogy, and content knowledge (TPACK) framework [6].

This workshop will cover fundamentals of flipped instruction for active learning, its potential benefits and important considerations for teachers before implementing flipped instruction strategy in their classrooms. The essential elements of TPACK framework, their interaction and its relevance to flipping the classroom instruction will also be focused during the workshop. A major objective of this workshop is to familiarize the audience with freely available web tools

and resources that can help in implementing the flipped instruction strategy. The presenters will cover the web tools and provide a hands on demonstration to integrate technology in classrooms using those tools for flipped instruction. The presenters have experience of implementing these web-based tools in instructional technology and engineering courses at Arkansas Tech University and will cover case studies highlighting implementation of flipped instruction in college level courses.

An important element of implementing flipped instruction in classrooms is to assess its impact on student learning outcomes and their self-efficacy. The self-efficacy construct is used as a measure of students' self-judgment that reflects what students believe they can do with the skills they possess. The presenters will introduce the audience to approaches that can help them develop instruments to measure self-efficacy of students in their flipped courses and compare the results with lecture based methods. The presenters will also briefly cover methods to analyze the collected data through developed measures to study impact of flipped instruction on their students and draw conclusions that may help them improve pedagogy. Detailed schedule of the workshop is given in Table I below.

Table I: Detailed Schedule of the Proposed Workshop

Activity	Duration (Minutes)
Flipped Instruction and Active Learning - Overview	10
TPACK and its relevance to flipped instruction	5
Free web tools and resources for teachers - Hands on Demonstration	40
Case studies - Flipped classroom implementation in college courses	15
Assessing Impact of flipped instruction on student learning outcomes and self-efficacy	10
Question and Answer Session	10
Total Duration	**90**

References:

[1] Hattie, J. Visible Learning: A Synthesis of Over 800 Meta-analyses Relating to Achievement, Routledge, New York, First edition, 2009.

[2] Schwerdt, G. and Wuppermann, A., “Is Traditional Teaching Really All that Bad? A Within- Student Between-Subject Approach”, *Economics of Education Review*, Vol. 30, 2011.

[3] Goodwin, B., & Miller, K., "Research Says / Evidence on Flipped Classrooms in Still coming In". *Technology Rich Learning*, Vol. 70, No. 6, pp. 78-80, 2013.

[4] Frydenberg, M., "Flipping Excel". Information Systems Education Journal, 11(1), 2013.

[5] Koehler, M. and Mishra, P., " What Is Technological Pedagogical Content Knowledge?", *Contemporary Issues in Technology and Teacher Education*, Vol. 9, No. 1, pp. 60-70, 2009.

[6] Olofson, M., Swallow, M., and Newmann, M., " TPACKing: A Constructivist Framing of TPACK to Analyze Teachers' Construction of Knowledge", *Computers and Education*, Vol. 95, pp. 188-201, April 2016.