

**What are Students' Perceptions Regarding Using a Flipped Classroom  
to Deliver Agricultural Mechanics Course Instruction?**

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### **Introduction and Theoretical Framework**

As student engagement factors tend to change with each successive generation of students, so must instructors' approaches to teaching and learning (Edgar et al., 2016). The increasing emphasis on student-centered, active learning in American classrooms dictates that instructors be open to attempting new approaches to reaching and teaching their students (McCubbins et al., 2018). One such approach that has proliferated across the American university landscape in recent years is the flipped classroom (O'Flaherty & Phillips, 2015). Student-centered in nature, flipped classrooms provide students with the flexibility to peruse course content online at their convenience before actively engaging in deeper, meaningful applications during course meetings (McCubbins et al., 2018). As instruction in agricultural courses is often centered on preparing students to solve complex, thought-provoking problems (Parr & Edwards, 2004; Phipps et al., 2008), the applications that can be used within flipped classrooms often align well with instructors' goals for student learning.

The active nature of the flipped classroom often lends itself well to agricultural courses (McCubbins et al., 2018). In the context of an agricultural teacher education course taught using a flipped classroom, Connor et al. (2014) found that "a flipped classroom approach seems to have promise as a model for delivering a teaching methods course" (p. 65) and opined that "other instructors of similar courses attempt a flipped classroom approach to test the model in other contexts" (p. 65). While Connor et al. (2014) studied using a flipped classroom in agricultural teacher education and McCubbins et al. (2018) researched its use in an agricultural capstone course, the application of the flipped classroom in the context of university-level agricultural mechanics courses has received limited scholarly attention. Figland et al. (2020) recently helped to address this gap in the literature, finding that students who experienced a flipped classroom in an introductory-level agricultural mechanics course viewed the experience in a favorable light. Thus, this led to our guiding research question: Would students in a similar course at another institution perceive their experience comparably?

We used Murillo-Zamorano et al.'s (2019) Flipped Classroom in Higher Education model to theoretically underpin our study. Their model indicated that flipped classroom instruction can directly and positively affect students' knowledge, skills, and engagement, which in turn directly and positively affects a student's satisfaction with the course. We used influences from their model to guide the design and discussion components of our study.

### **Purpose and Objectives**

The purpose of our study was to determine students' perceptions of their engagement and learning in a flipped introductory-level agricultural mechanics course at Illinois State University (ISU). Our specific objectives were to: (1) determine student-perceived levels of engagement in a flipped classroom design and (2) examine student-perceived levels of learning when enrolled in a flipped classroom design course. Our study aligned with the AAAE National Research Agenda Research Priority 4: Meaningful, Engaged Learning in All Environments (Edgar et al., 2016).

## Methods

This descriptive study was designed to determine student perceptions of engagement and learning in the flipped Introduction to Agricultural Engineering Technology course at ISU. After receiving IRB approval, we used a valid and reliable instrument employed within a prior study (i.e., Russell et al., 2016) to collect data from students who completed the course during the 2021 and 2022 calendar years. Data were electronically collected each semester during their final laboratory session. Our instrument consisted of three parts. Part one asked five questions related to their previous experience in a flipped classroom and their perceived levels of enjoyment, workload, and overall learning in our course. Part two consisted of six Likert-type questions regarding their academic preparedness, levels of engagement, and overall satisfaction of the course. Part three consisted of six demographic questions. We received 61 usable responses, yielding a 70.9% response rate. We used SPSS<sup>®</sup> version 26.0 software to analyze our data. To address our two research objectives, we used descriptive statistics to assess both student levels of engagement and their perceived levels of learning while enrolled in a course that uses the flipped classroom design.

## Results

Approximately two-thirds ( $n = 41$ ; 67.2%) of participants indicated having some previous experience with a flipped classroom in a post-secondary setting prior to taking our course. When asked about the amount of work in our flipped course, 75.4% ( $n = 46$ ) of participants said the workload was similar to a traditional classroom while 19.7% ( $n = 12$ ) said the workload was less. Students self-reported spending an average of 3.54 hours per week outside of our weekly sessions preparing for course activities. Eighty-two percent ( $n = 50$ ) of participants said they were better engaged in our flipped classroom design while overall engagement had a mean score of 5.98 on a seven-point, Likert-type scale. Fifty-two participants (85.2%) also indicated their level of enjoyment in the course increased due to the flipped classroom design.

When examining perceived levels of learning, 42.6% ( $n = 26$ ) of participants indicated their level of overall learning increased in the flipped classroom while 45.9% ( $n = 28$ ) said it was similar to a traditional course. Overall, 90.2% ( $n = 55$ ) of participants said they were satisfied with the online component of the course and 96.7% ( $n = 59$ ) of participants indicated they were satisfied with the in-person component of the course.

## Conclusions, Implications, and Recommendations

Similar to those of Figland et al. (2020), our findings indicate that using a flipped classroom design to deliver an introductory-level agricultural mechanics course is a worthy endeavor that can positively impact students' course experience. Every semester we are finding similar results suggesting that students at ISU prefer this teaching strategy over a traditional lecture style. Hence, the lead author plans to continue teaching the Introduction to Agricultural Engineering Technology course via a flipped classroom design for the foreseeable future. We recommend that instructors of introductory-level agricultural mechanics courses at other universities consider using a flipped classroom design. We also recommend that other agricultural teacher educators consider replicating our study to further explore this topic.

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