

**Incorporating a Flipped Classroom Design into a
Teacher Education-focused Agricultural Mechanics Course**

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Introduction

Flipped classroom designs have become more prevalent in higher education settings in recent years (O’Flaherty & Phillips, 2015). As a student-centered approach to teaching and learning, flipped classrooms allow students to review course content online at their convenience prior to engaging in complex course activities and applications. Intended to serve as an active learning environment, flipped classroom designs can offer much for agricultural students (Connor et al., 2014; McCubbins, Paulsen, & Anderson, 2016). McCubbins et al. (2016) found students in an undergraduate-level capstone course responded positively to the use of a flipped classroom design. More recently, McCubbins, Paulsen, and Anderson (2018) expressed that “[f]lipped classrooms, as an example of an active learning approach, have been shown to be effective in long-term student outcomes” (p. 135).

Connor et al. (2014) noted flipped classroom designs hold potential for use in agricultural teacher education coursework, particularly in the context of a teaching methods course. Moreover, Connor et al. (2014) noted that despite some limitations, “students felt the flipped classroom approach was an effective approach to learn concepts in the class” (p. 74). Both Connor et al. (2014) and Connor et al. (2014) provided recommendations for improving the flipped classroom design for students, opining that high-quality audio-visual materials should be used and that perhaps the more flexible scheduling offered by a flipped classroom design may not necessarily be beneficial to all students. Despite these initial improvement needs, Connor et al. (2014) suggested “instructors of similar courses [should] attempt a flipped classroom approach to test the model in other contexts” (p. 75). Perhaps a teacher education-focused agricultural mechanics course taught at Iowa State University (ISU) would provide a suitable context for a flipped classroom design.

How it Works

Taught during each fall and spring semester, the Methods of Teaching Agricultural Mechanics (AgEdS 488) is built into the agricultural teacher education framework at ISU. As the only agricultural mechanics-related course that pre-service teachers at ISU are required to complete, it is intended to provide pre-service teachers with professional development opportunities related to teaching and learning in the context of agricultural mechanics (S. Smalley, personal communication, October 28, 2019). Course content is focused on a combination of technical agricultural mechanics and teacher education knowledge and skill development. Topics addressed within the course include developing learning objectives in lesson plans, assessing learners’ psychomotor skill development, managing student behavior, teacher liability when teaching agricultural mechanics, and woodworking, welding and metalworking, electricity, plumbing, and modern agricultural technology principles and applications.

As instructors for this course, we believed the breadth of the course lent itself to attempting new and novel content delivery methods. In particular, our interest was on increasing

the flexibility of our instructional approach to maximize pre-service teachers' opportunities to actively engage with course content during each course meeting. In particular, we noticed many of our pre-service teachers were quite limited in their technical agricultural mechanics knowledge and skill abilities. Thus, we elected to follow Connor et al.'s (2014) recommendations and implement a flipped classroom design. The flipped classroom design was initially implemented during the Fall 2018 semester and replaced the traditional lecture format previously used during the course.

The lead instructor for the AgEdS 488 course, who was also the lead author of the present abstract, developed a series of high-quality, pre-recorded videos that addressed the course content previously taught during the lecture format. In addition, PowerPoint presentations and supplemental reading materials were designated and provided to the pre-service teachers. These instructional materials were hosted in their respective modules on the course learning management system (LMS). Pre-service teachers were expected to view these materials prior to physical course meetings. To provide for accountability in preparing for course meetings, quizzes based on the instructional materials were used prior to engaging in course meeting activities. These quizzes included a combination of assessment question types (e.g., multiple-choice, short answer, etc.) and were intended to help stimulate pre-service teachers' thinking about forthcoming course activities, such as wiring electrical circuits, developing agricultural mechanics facility layout plans, and so forth. After each quiz was completed, the lead instructor facilitated a brief discussion about the quiz, the course module concepts, and the forthcoming in-class activities to check for understanding.

Implications

Our experiences implementing a flipped classroom design into the AgEdS 488 course have been overwhelmingly positive. Pre-service teachers have anecdotally indicated the ability to review course content at their own pace has been useful. Moreover, pre-service teachers have reportedly enjoyed the ability to access, download, and save course content for use during student teaching and beyond. As also indicated by Connor et al. (2014), the pre-service teachers' adjustment to a more active, learner-centered instructional approach has not been without challenges, as some pre-service teachers found it difficult to balance our activity preparation expectations (i.e., reviewing content prior to course meetings) with their comfort with instructor-centered, lecture-based content delivery methods. From our perspective as course instructors, we found limiting our time lecturing to a brief period of clarification has resulted in several saved hours of class time each semester that can instead be devoted to performing agricultural mechanics-related activities often expected of school-based agricultural education (SBAE) teachers, such as planning for instruction, learning equipment operation procedures, and so forth.

Future Plans, Advice to Others, & Costs

As suggested by Connor et al. (2014), we plan to continually review our instructional practices to best assist our pre-service teachers' professional development. We do suggest other agricultural teacher educators consider using this approach within their coursework. The primary cost that we encountered was time to develop and modify course module materials to fit within the flipped classroom design.

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