Lights, Camera, Action! Creating Skill Demonstration Videos for Use in University-level Agricultural Coursework

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Introduction

Psychomotor skill acquisition takes a considerable amount of time and effort (Wulf, 2007). Moreover, the psychomotor skill acquisition process can be a complex yet rewarding endeavor, especially considering the scope of long-term skill application beyond the classroom (Osborne, 1986). Psychomotor skills can be described as a linkage between mental and physical efforts and processes (Lancelot, 1944). Osborne (1986) noted agricultural education settings present a wide range of opportunities for psychomotor skill development, refinement, and application. The teaching and learning of psychomotor skills are commonplace in agricultural education settings, especially in laboratory environments (Phipps, Osborne, Dyer, & Ball, 2008). This is particularly true in agricultural mechanics laboratories.

Agricultural mechanics laboratories are used to provide teaching and learning opportunities in a myriad of content areas (Saucier, Vincent, & Anderson, 2014), including welding, woodworking, and so forth. As a content area, welding is frequently taught as a component of agricultural mechanics curricula (Pate, Warnick, & Meyers, 2012). From a psychomotor skill perspective, welding processes such as shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) require mental focus and physical manipulation of objects to successfully create a weldment (Bowditch, Bowditch, & Bowditch, 2017).

Welding skill development is often accomplished through engagement in repetitive practice sessions (Bowditch et al., 2017). Practice sessions can consume numerous resources, such as metal coupons, electrodes, electricity, and time. The consumption of these resources, particularly valuable class time, in the context of a university-level agricultural mechanics course can be exacerbated when live skill demonstrations are conducted for each new welding procedure, equipment set-up, joint configuration, and so forth. Perhaps an alternative approach to providing welding skill demonstrations is practical, especially if conducted through high-quality videos that can be viewed multiple times prior to a class session.

How it Works

The Agricultural Mechanics Applications (AgEdS 388) course at Iowa State University (ISU) is taught every semester and uses a flipped classroom design. Flipped classroom designs allow students to view instructional materials such as videos, reading materials, and so forth prior to the designated course time (Connor, Stripling, Blythe, Roberts, & Stedman, 2014; O'Flaherty & Phillips, 2015). Moreover, flipping a classroom can allow students to work at their own individual pace to view and process content information, thereby helping to provide a student-centered approach to course instruction (Connor et al., 2014). In keeping with the flipped classroom design of this course, we elected to begin delivering welding skill demonstrations via a series of videos hosted on the course learning management system (LMS). It should be noted that while students were required to view these videos at designated points during the semester, we also would conduct any in-class skill demonstration a student requested directly.

We identified an assortment of welding topics presently addressed during the AgEdS 388 course content that could be delivered by using pre-recorded videos in lieu of in-class demonstrations. These topics were: (1) personal protective equipment (PPE) selection and use, (2) setting up a GMAW system, (3) performing a 1G butt weld using the GMAW process, (4) performing a 2F lap weld using the GMAW process, (5) performing a 2F tee weld using the GMAW process, (6) cleaning and maintaining a welding system, (7) switching a multi-process welding system from GMAW to SMAW, (8) setting up a SMAW system, (9) performing a 1G butt weld using the SMAW process, (10) performing a 2F lap weld using the SMAW process, (11) performing a 2F tee weld using the SMAW process, and (12) cleaning a welding station.

We contacted a media specialist in the Brenton Center for Agricultural Instruction and Technology Transfer (i.e., the Brenton Center) at ISU to schedule an appointment to record the demonstration videos. We subsequently identified a suitable date and time to record the videos and to determine what specialized recording equipment was needed. Throughout one six-hour day in May 2018, videos for each of the 12 abovementioned topics were recorded in the ISU agricultural mechanics laboratory. Once edited, each video ranged from five to 10 minutes in length, included optional closed captioning, reinforced safe laboratory work practices, and provided detailed explanations about each task being performed.

Since the Fall 2018 section of the AgEdS 388 course, each video has been integrated as required viewing in its respective LMS module page. In keeping with the principles of flipped classroom design (Connor et al., 2014), students have been expected to view the appropriate videos prior to course meetings. Preceding each course meeting's welding activities, we answered any questions students had about the tasks we expected them to perform.

Implications

We found integrating the welding skill demonstration videos into the AgEdS 388 course design has resulted in overwhelmingly positive student response. It has been interesting to note students have very rarely asked for live demonstrations of the welding skill activities and have, anecdotally, reported the videos were of adequate quality to allow them to comfortably attempt the tasks set before them without a live demonstration. In comparison to semesters in which live demonstrations were conducted before each course meeting's welding activities, we found we were able to re-purpose approximately 20 minutes of each course meeting toward extending students' skill development and repetition time.

Future Plans, Advice to Others, & Costs

Based on our results thus far, we plan to continue using these videos in the AgEdS 388 course design. Our primary costs associated with producing these videos were time and welding consumables. Because these videos were intended for use in an ISU course, we were not assessed any video production fees by the Brenton Center. We anticipate we will expand this concept into other agricultural mechanics content areas. We recommend other agricultural teacher educators consider this instructional approach when appropriate. Moreover, we further recommend studies be conducted to provide comparisons in welding skill performance based on information delivery format (i.e., live demonstrations versus video-based demonstrations).

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