

**Using Simulation to Teach Livestock Management Practices
in an Undergraduate Agricultural Science Course**

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Introduction & Need for Innovation

Agricultural education practitioners employ various approaches to maximize student engagement and learning with an end goal of preparing students for opportunities in the agricultural industry. Factors such as lack of access to ideal facilities and changes in societal norms have often fostered the need to re-assess teaching and learning practices in agricultural education settings (Edgar et al., 2016). This has been especially pertinent in the context of using live animals for teaching purposes, which is becoming increasingly difficult and in some cases impractical. Thus, the need exists to explore new approaches to teaching and learning about animals (Hart et al., 2005). Perhaps using simulation could serve as a practical alternative in lieu of traditional, hands-on approaches to animal science instruction involving live animals.

Simulation is a viable method for addressing students' learning needs (Agnew & Shinn, 1990; Brown & Knobloch, 2022). Simulations can be carried out using a range of applications, such as virtual reality, augmented reality (Bailenson, 2018), and physical models (Agnew & Shinn, 1990). When used appropriately, simulation can be used for assorted purposes, such as introducing new, abstract concepts to students and teaching students new psychomotor skills safely (Bailenson, 2018; Wells & Miller, 2022). As psychomotor skills blend both cognition and physical performance (Lancelot, 1944), it is imperative that the teaching and learning of such skills be well-planned and facilitated appropriately (Phipps et al., 2008).

The teaching and learning of psychomotor skills via hands-on experiences has historically been an important function of agricultural education (Lancelot, 1944; Phipps et al., 2008). Simulation has long been used to teach psychomotor skills in agricultural education settings. For example, Perritt (1984) studied using a tractor power train simulator as a physical teaching tool and found that implementing such a device can be practical without negatively impacting student learning. Agnew and Shinn (1990) further indicated that "simulation activities can provide students with basic knowledge and understanding" (p. 15) of concepts and procedures. More recently, Wells and Miller (2022) noted that using a virtual reality welding simulator system for welding skill training purposes can be effective and appropriate, particularly when teaching novices. Further, while students see value in strategically and deliberately using simulation as a teaching tool, they also indicate that simulation should be used to supplement and not completely replace actual learning experiences (Tiffany & Hoglund, 2014; Wells & Miller, 2022), such as learning to administer vaccinations or castrate livestock. Considering the preceding literature, there exists an opportunity for simulation to be used when teaching selected animal science-related psychomotor skills within an undergraduate agricultural science course.

How it Works

The lead author of this abstract, an animal scientist at Southern Arkansas University (SAU), is responsible for delivering a wide range of animal science coursework, such as Introduction to Animal Science, Beef Production, and Ruminant Animal Production. The courses

he teaches are heavily laboratory-based and include extensive psychomotor skill instruction (e.g., palpating cattle, administering vaccinations, etc.) intended to provide students across SAU's six undergraduate agricultural science degree programs with diverse, practical experiences in different facets of livestock production. However, the current limitation with delivering the animal science coursework and experiences at SAU is the lack of suitable access to animals and facilities beyond beef cattle and chickens, such as horses, sheep, and swine, which can be used to support teaching and learning. Such limitations have created the opportunity to help address students' learning needs through physical simulation models.

The lead author used internal institutional teaching grant funds to acquire one Realityworks® Swine Litter Processing Simulators kit during the Spring 2022 semester. He first used the kit during the laboratory component of his Fall 2022 semester Introduction to Animal Science course. The kit contained: (1) four piglet simulators, (2) four teeth and tail snipper tools, (3) four ear notchers, (4) four plastic scalpels, (5) assorted consumable plastic and cloth supplies to teach needle teeth clipping, castration, tail docking, and ear-notching, (6) electronic curricula, and (7) a one-year warranty on the kit's components (Realityworks, 2022). During laboratory exercises focused on introductory-level swine management, the lead author used the kit to facilitate instruction in needle teeth clipping, ear-notching, castration, and tail-docking to all 85 students enrolled across all four laboratory sections of his course. The lead author grouped his students into small teams and each team was provided with one piglet and one set of tools to carry out the assigned laboratory exercises. He first demonstrated each task and subsequently allowed students to perform each task while he circulated around to assist students as needed. Between each laboratory section, the lead author reset each piglet to its original, unaltered condition (e.g., removed spent consumable materials on each piglet, etc.)

Implications

Using the kit in the laboratory component of the lead author's Introduction to Animal Science course proved fruitful for two reasons. Chiefly, the lead author was able to successfully facilitate psychomotor skill instruction with a livestock species that is not available for use on the SAU campus. Secondly, students anecdotally reported that they felt able to successfully and safely perform the designated tasks without fear of injuring themselves or a live animal. While using simulation should not completely replace actually performing hands-on tasks, it should be employed to teach students when appropriate to do so (Wells & Miller, 2022).

Future Plans and Advice to Others

The lead author plans to continue using the kit in the laboratory component of his Introduction to Animal Science course. Based on his experiences, he recommends that others who teach animal science-related subject matter consider purchasing and employing this kit when teaching swine management practices, particularly to novices.

Costs

One Realityworks® Swine Litter Processing Simulators kit costs \$1,999.00. Beyond the kit's purchase price, the lead author's time preparing laboratory activities was the primary cost.

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