Using Simulation to Teach Swine Management Practices in Introductory-level Animal Science Coursework

Introduction

Teachers of agricultural subject matter use various approaches to maximize student engagement and learning to prepare students for opportunities in the agricultural industry. However, factors such as lack of access to ideal facilities and changes in societal norms have created the need to re-assess teaching and learning practices in agricultural 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 (Brown & Knobloch, 2022). One example of simulations is teaching using physical models (Agnew & Shinn, 1990). When used appropriately, simulation can be used for assorted teaching purposes, such as introducing new, abstract concepts to students and teaching students how to perform new psychomotor skills (Bailenson, 2018; Wells & Miller, 2022). As psychomotor skills blend both mental skills and physical performance (Lancelot, 1944), it is imperative that the teaching and learning of such skills be facilitated appropriately (Phipps et al., 2008).

Agnew and Shinn (1990) 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 simulation for psychomotor 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 swine management-related psychomotor skills within an introductory-level animal science course.

Implementation Details

The lead author of this teaching tip is an animal scientist at Arkansas State University. Prior to January 2024, he served as an animal scientist at Southern Arkansas University (SAU). While at SAU, the courses he taught were heavily laboratory-based (e.g., Introduction to Animal Science, Beef Production, and Ruminant Animal Production) and include extensive instruction requiring an assortment of psychomotor skills (e.g., palpating cattle, administering vaccinations, etc.) intended to provide students with diverse, practical experiences in different facets of livestock production. However, the primary limitation with delivering animal science instruction at SAU was the lack of suitable access to animals and facilities beyond beef cattle and poultry, such as swine, which can be used to support teaching and learning. Such limitations created the opportunity to help address student learning needs through physical simulation models.

We used internal institutional teaching grant funds offered by SAU to acquire one Realityworks® Swine Litter Processing Simulators kit (Realityworks, Eau Claire, Wisconsin, United States) during the Spring 2022 semester. We first implemented the simulation kit during the laboratory component of the Fall 2022 semester Introduction to Animal Science course. The kit included materials to teach needle teeth clipping, castration, tail docking, and ear-notching for swine litters contained: (1) four piglet simulators (each resemble young piglets), (2) four teeth and tail snipper tools, (3) four ear notchers, (4) four plastic scalpels, (5) assorted consumable plastic and cloth supplies, (6) electronic curricula, and (7) a one-year kit warranty.

During laboratory exercises focused on introductory-level swine management, we used the kit to facilitate instruction to all 85 students enrolled across all four course laboratory sections. We grouped students into small teams and provided each team with one piglet and one set of tools to carry out the assigned laboratory exercises. We demonstrated each task and subsequently allowed students to perform each task while we circulated around to assist students as needed. Between each laboratory section, the we reset each piglet to its original, unaltered condition (i.e., removed spent consumable materials on each piglet, etc.)

Summary and Recommendations

Kit implementation in the laboratory component of an Introduction to Animal Science course proved fruitful for two reasons. Firstly, we were 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.

Based on experiences using the simulation kit, the following recommendations for other instructors to consider are:

1) Faculty who teach about swine should consider acquiring and using these kits (or those of a similar nature) to teach swine management-related psychomotor skills, particularly when introducing students to swine;

2) Acquiring and using live animals for instructional purposes can be hazardous and stressful for both the animals and students. Using simulation as a teaching tool may be useful for helping reduce stress for both;

3) While the cost of one kit is in excess of $2,000.00, faculty who wish to purchase the kit should consider exploring opportunities to use institutional funds to do so. The majority of the kit's resources are reusable, which helps to extend the kit's utility. Moreover, while $2,000.00 is a considerable amount of funds in and of itself, it pales in comparison to the costs and other inputs associated with raising and maintaining live animals and their facilities for instructional purposes.

The challenges associated with using live animals for instructional purposes continue to increase (Hart et al., 2005). Using simulation should not completely replace actually performing hands-on tasks. However, it should be employed to teach students when appropriate to do so (Wells & Miller, 2022).

References

Agnew, D. M., & Shinn, G. C. (1990). Effects of simulation on cognitive achievement in agriculture mechanics. *Journal of Agricultural Education*, *31*(2), 12-16. doi:10.5032/jae.1990.02012

Bailenson, J. (2018). *Experience on demand: What virtual reality is, how it works, and what it can do*. W. W. Norton & Company, Inc.

Brown, A. H., & Knobloch, N. A. (2022). Effects of a simulation on eighth grade students' business management knowledge and entrepreneurial intent in an exploratory agriculture course. *Journal of Agricultural Education*, *63*(2), 88-101. https://doi.org/10.5032.jae.2022.02088

Edgar, D. W., Retallick, M. S., & Jones, D. (2016). Research priority 4: Meaningful, engaged learning in all environments. In T. G. Roberts, A. Harder, & M. T. Brashears. (Eds.), *American Association for Agricultural Education national research agenda: 2016-2020*. Gainesville, FL: Department of Agricultural Education and Communication.

Hart, L. A., Wood, M. W., & Weng, H. (2005). Mainstreaming alternatives in veterinary medical education: Resource development and curriculum reform. *Journal of Veterinary Medicine Education*, *32*(4), 473-480. https://doi.org/10.3138/jvme.32.4.473

Lancelot, W. H. (1944). *Permanent learning: A study in educational techniques*. John Wiley & Sons, Inc.

Phipps, L. J., Osborne, E. W., Dyer, J. E., & Ball, A. (2008). *Handbook on agricultural education in public schools* (6th ed.). Thomson Delmar Learning.

Realityworks. (2022). *Swine litter processing simulator*. Retrieved from https://www.realityworks.com/product/swine-litter-processing-simulators/

Tiffany, J., & Hoglund, B. A. (2014). Teaching/learning in Second Life: Perspectives of future nurse-educators. *Clinical Simulation in Nursing*, *10*, 19-24. https://ac.els-cdn.com/S1876139913001606/1-s2.0-S1876139913001606-main.pdf?_tid=7a59f746-aaad-4f1f-8f6ed959a27a3b3b&acdnat=1549230213_383ec46e8fc044eff5c08c3c0551a515

Wells, T., & Miller, G. (2022). Students' perspectives on using virtual reality technology in a university-level agricultural mechanics course. *Journal of Agricultural Education*, *63*(2), 17-36. https://doi.org/10.5032/jae.2022.02017

Submitted by:
Randy H. Burnett, PhD
Arkansas State University
Jonesboro, AR

Trent Wells, PhD
Murray State University
Murray, KY