Building Core Animal Science Knowledge through Project-Based Study: Name that Tool

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Abstract

The Boyer Commission (1998) called on universities to 'reinvent' undergraduate programs and delivery with the objective to engage students in the process of inquiry, beginning in the freshman year. It also called on universities to develop a sense of community amongst the student population to improve the overall learning environment for students inside and outside of the classroom. At the University of Alberta this call to change the learning environment at the introductory level has been a focal point of recent changes to the introductory "Animal Science 200" class taught within the Faculty of Agriculture, Forestry and Home Economics. The teaching team has implemented a project-based learning experience, called 'Name that Tool,' that engages students in the inquiry process, while also practicing their oral and written communication skills. It was intended that this experience would result in a more involved and engaged student population with demonstrated improvements in confidence, ability, and overall satisfaction. After this project, the differences in knowledge base between urban and rural backgrounds should be less noticeable, as all students have a stronger foundation on which to build new knowledge.

Introduction

One of the most challenging, and most important, issues raised by the Boyer Commission (1998) in the United States was to create an inquiry-based first year experience to set the stage for a research-based undergraduate education. The difficulty lies in the fact that "the freshman year … must be the bridge between high school … on the one side and the more open and more independent world of the research university on the other, and it must excite the student by the wealth, diversity, scale, and scope of what lies ahead" (Boyer Commission, 1998). Many disciplines continue to struggle with the need to balance the content that their disciplinary tradition dictates is necessary to ground students in that particular discipline with the need to make students more engaged in the inquiry process that we increasingly know is beneficial to students' learning.

Agricultural education, in both Canada and the United States, has a history of experiential, hands-on, active learning, which is at the core of what the Boyer Commission aspires towards in a 'reinvented' undergraduate education. The issue has been examined both at the secondary and higher education levels within agriculture (Parr and Edwards, 2004; Knoblach, 2003). This form of active, experiential learning has been called a constructive-developmental pedagogy, the principles of which are to validate students as "knowers," to situate learning in the students' experience and to conceive of learning as mutually constructing knowledge (Baxter Magolda, 1999). Recently, it has been described by researchers in the UK as moving students beyond a point of 'educational bulimia' where they memorize content knowledge and regurgitate it for an exam prior to wiping it from their memory (Lea et al., 2003). These principles are at the core of a curriculum change in an introductory animal science class at the University of Alberta in Edmonton, Canada.

Building in project-based learning opportunities, which meet these principles, in first-year courses, is challenging as these classes are typically large, the students may have little or no background knowledge, and the student population can be very heterogeneous. This paper describes a learning opportunity that to date has been offered to three cohorts of students in an introductory animal science class. The overall objective of this project, from a content perspective, is to establish a diverse knowledge base in all students so that they develop a base to build new course material on. This project is also designed to reduce the variation in student background level, as urban students were exposed to a wide array of novel agricultural objects that some rural students would already be knowledgeable about. It is also designed to challenge rural students as some objects are selected from somewhat obscure applications. The primary objective from a process perspective is to provide entry level students with the opportunity for project-based learning. It is intended that students would become sufficiently familiar with the objects to lead class discussion. This exercise is also planned to provide the opportunity for acquiring skills in oral

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communication and poster presentations. The focus on helping students acquire skills that are critical for their future academic study, including critical thinking and analysis skills, communication skills, and writing skills, is a fundamental component of what the Boyer Commission intended through its emphasis on an inquiry-based learning environment (Boyer Commission, 1998). A further objective of the course is to build on the Boyer Commission recommendation of "building community" through facilitating student discussion of relevant problems inside and outside of the classroom environment.

Methods

Three cohorts of students in Animal Science 200 (n= 156) have been assigned this project early in the second week of the term. Individual students were assigned a piece of equipment used in primary animal agriculture, or used in the processing of animal agricultural products. A total of 90 diverse items were available. Some items were a component of a larger piece of equipment. A partial list of items used can be found in Table 1.

Each student was allowed a two-week period of time to complete the assignment. They were instructed to create a one page Powerpoint poster containing the name, a brief description, and the primary function and/or objective of use of the item. It was also suggested that they provide other relevant information, including the consequences of not using the equipment, and other alternatives that could be used for the same purpose. Students were asked to submit the poster electronically by email. The teaching team emailed students a digital photo of their item to use in the poster so the written content of the poster could remain the focus of the exercise.

When the posters were completed, students were allocated five minutes to present their item and poster to the course laboratory grouping they were registered in (typically 15 to 30 students per lab). A further two to five minutes were allocated for questions and group discussion involving the presenting student, the instructional teams and other students. The assessment (worth a total of 10% of term grade) focused on the content of the report (5%), oral presentation skills (3%) and creativity and overall presentation of the written report (2%). The final assessment for the project was by consensus of the instructor and teaching assistants that make up the teaching team.

Results and Discussion

Students responded to this assignment with creativity and an atmosphere of enthusiasm was detected. We anticipated that students would be encouraged to be creative if they recognized that the

Table 1. Examples of items used as gifts in "Name that Tool"

Chick gravity-fed water drinker	Kmar heat detector
Sheep prolapse retainer	Removable cattle leg tag
Roche color fan (yolk color assessment)	Mastitis test paddle
Cattle stock prod	Turkey trap nest door
Cattle water deicer	Rooster semen collecting apparatus
Milking machine filter	Swine insemination bottle and catheter
Teat dip bottle	Dummy sow for semen collection (photo only)
Electric fence gate clip	Mechanical poultry harvester (photo only)
Nylon bag for ruminant digestibility studies	Swine herding panel (photo only)
Rumen magnet	Poultry incubator flat
Poultry shackle	Cattle heat branding iron
Calf nipple	Calf elastrator ring
Chick nipple drinker	Ram marking crayon
Laying hen drinking cup	Cattle spray marker
Lamb puller	Cattle rectal thermometer
Calf pulling chains	Smoke pencil for ventilation monitoring
Heater thermostat wafer	Poultry ID wing band
Rectal palpation glove	Poultry ID leg band
Disposable hair net	Bar-Code poultry neck ID tag
Poultry deboning cone	Environment enrichment "toy" for caged laying hens
Broiler breeder nest pad	Sheep shears
Hydrometer (Egg shell density testing)	Cattle horn weights
Finger from chicken plucker	Hoof pick
Cattle rumen drench kit	Ear tag tattoo

teaching team was willing to be creative in assigning the items. Hence, we wrapped each item in colorful gift wrap to have students consider their items to be "gifts." Mankin et al. (2004) reported that freshman students were motivated to learn most by learning environments which were interactive. Further positive classroom environment descriptors included terms such as "relaxed, laid back, comfortable, humor and fun." Student comments strongly supported that these descriptions were good ones for "Name that Tool."

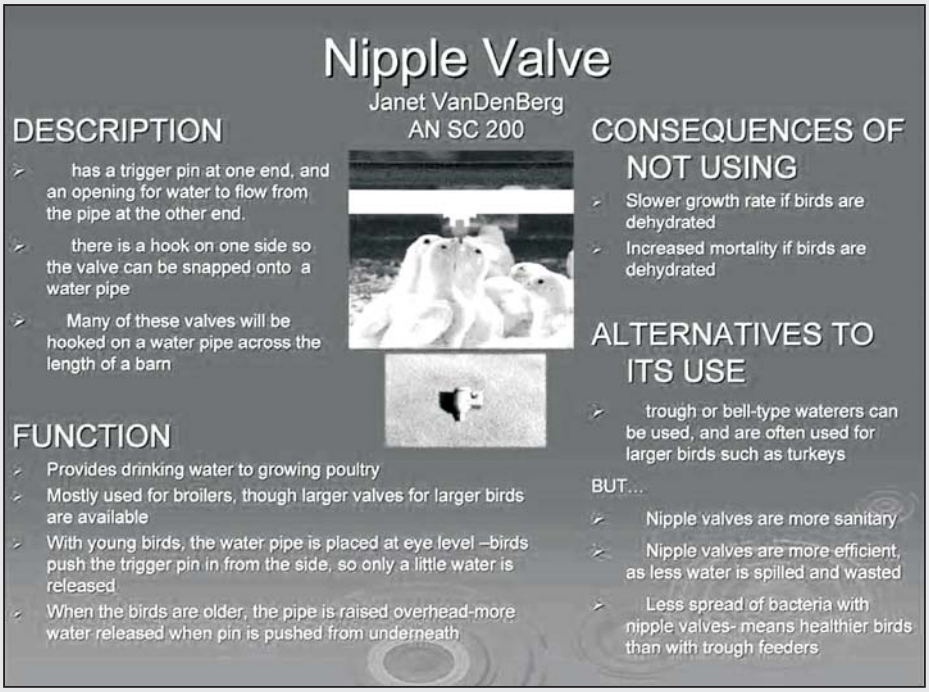

Figure 2. An example of a "Name that Tool" poster presentation of a relatively unknown tool.

The project description has been refined after each cohort to provide students with clear expectations. For example, students were very creative in the use of animations in presenting the posters, however, in some cases the animations distracted from content. Some students interpreted one slide to be made up of ten or more mouse-clicked entries of material (text boxes or photos). Later cohorts were allowed animations, but were also instructed that each entry to the poster could not cover a previous entry. This was to enable the printing of the posters at a later date without any of the content being covered. The course team also learned to specify a minimum font size (16 point) for the posters to ensure that other students could read the poster effectively.

Project-based learning, as it is used in this paper, can be understood as a hybrid form of inquiry-based and problem-based learning. It is not fully inquiry-based learning, as defined by Hudspith and Jenkins (2001), as the instructor rather than the student directs the question being examined to pursue a particular curricular objective. The process of inquiry-based learning, which can be defined as a "self-directed, question-driven search for understanding," expects students to engage with the subject matter in a manner that leads them towards forming their own central question to answer (Hudspith and Jenkins, 2001, p. 9). "(T)he aim of inquiry is to develop the skills needed to bring research to bear on the understanding of a central question" (Hudspith and Jenkins, 2001, p. 10). Project-based learning in

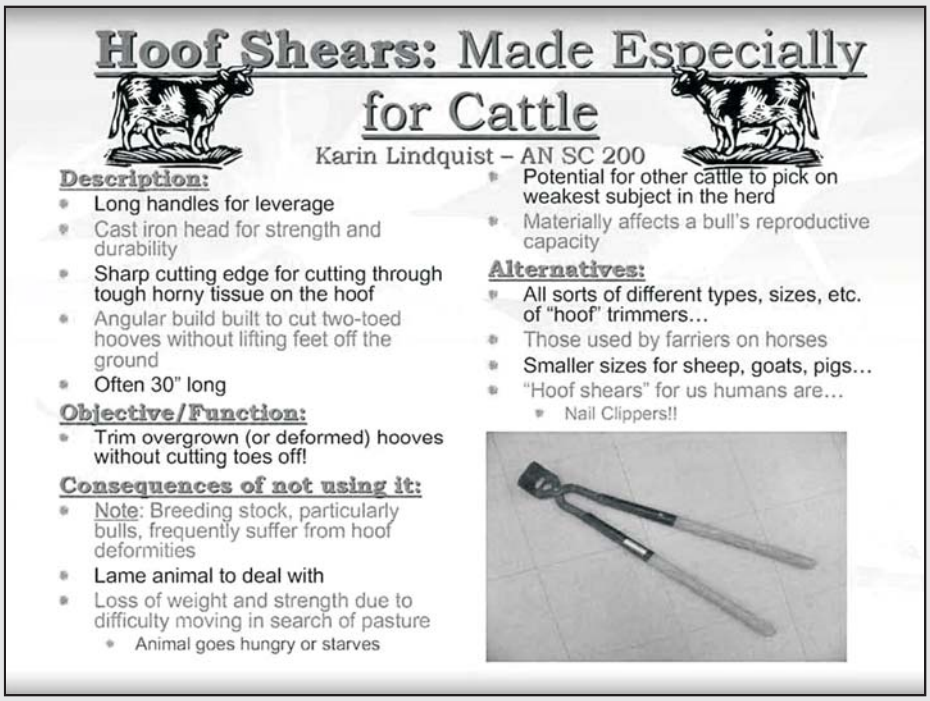

Figure 1. An example of a "Name that Tool" poster presentation of a relatively well known tool.

this context is a process of learning that introduces students to aspects of the inquiry process, focusing on skill development, while also helping to facilitate the understanding of critical curricular information necessary at the level of introductory animal science.

The Boyer Commission goal of introducing inquiry-based learning in the freshman year was realized in Animal Science 200 at the University of Alberta, in part, through this form of project-based learning. The 'name that tool' project introduced the students to the inquiry process and critical thinking and analysis, while providing them opportunities to also practice both oral and written communication skills. The Boyer Commission report stresses the importance of developing these higher order skills as students are introduced into higher education (Boyer Commission, 1998). This form of project-based learning, which would be easily adaptable beyond animal agriculture, helped to achieve those goals. Students demonstrated an incredible level of creativity and ingenuity in determining what their tool was, and were very successful in presenting their findings in the oral and written presentation of a poster, samples of which can be found in Figures 1 and 2.

This project also succeeded in achieving the Boyer Commission goal of developing a sense of community among students. Student interaction began the day the items or 'gifts' were assigned, as some individuals received assistance from class mates on the identity of their gift. Students who could not identify their gift a few days after receiving it, were instructed to solicit ideas from the class. The discussion which followed some presentations was wide-ranging and sometimes difficult to terminate. This question period allowed the discussion of knowledge that was diverse and represented a broad spectrum of the content one would expect to cover within an introductory Animal Science course. In most instances, time constraints meant that the question period was purposefully ended before all class discussion had been completed.

There are a number of specific benefits that have been realized through this project, many of which have not necessarily been expected but have important ramifications for both students in the class and for the instructor. While we did not measure student responses to this project, we observed a significant amount of personal growth shown by the students in terms of the confidence they have in their inquiry and communication abilities, as well as providing a way to provide a level playing field for the diverse backgrounds of the students in course.

Summary

Entry level courses offer an opportunity for creative learning, taking full advantage of group heterogeneity, the opportunity for shared experience reporting, keen student engagement and community building through the establishment of an effective cohort. This is one example, but this model could be adapted to “name that weed,” “name that feedstuff” or “name that breed or variety.” There is room for project-based study in entry-level agricultural courses.

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