

Scholarship of Teaching and Learning: Developing Math Skills in Equine Science Students through Using Relevant Business Applications

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Budget: \$2000

Involved STEM Courses:

EQSC 4369: Equine Facilities Management

Project Narrative:

Executive summary

During odd spring semesters we offer an equine facilities management course. This course offers students an opportunity to practice skills that are necessary for running an equine facility, including selecting appropriate types of fencing and calculating a quarterly feed and bedding order. During the semester, students apply lecture material to create a facility management plan. These plans require students to calculate fertilizer application rates and cubic footage of feed storage areas. We propose to modify the existing project through collaboration with Agricultural Business Faculty and add in a finance plan. For this addition, students will select a type of horse business and identify profitable services their business will offer. Based on these decisions they will develop cash flow sheets of monthly expenses and projected income from the services their business will offer. These are necessary skills for running a business; however, they require a familiarity with college-level math. Unfortunately, we as instructors often struggle with students' poorly developed math skills, such as use of percents and unit conversion. In addition to reviewing these concepts prior to their required use, we propose to loan calculators to students and employ the use of an undergraduate teaching assistant to assist with reviewing group project rough drafts and providing feedback to students. We will review feedback and student learning outcomes during summer 2021 to determine gaps in lecture content. We will use this knowledge to restructure the syllabus and lecture sequence to better support successful outcomes on the Facilities Management Plan.

Rationale

Equine Science students tend to have a passion for horses, and that translates into an intense interest in getting the science right. However, math skills and confidence in math skills are not commonly among these students' strong points, and this lack of confidence frequently hampers science knowledge acquisition. Many, if not most, of these students will transition from university to a working equine agricultural business where the lack of a strong skillset in math and science will severely hamper their efforts to successfully compete in the business environment in which they will land. As a practical example, pasture management is a critical component of both equine health and land stewardship and requires a working knowledge of basic soil chemistry and math skills for calculating fertilizer, lime, and seeding rates. Over or under application of fertilizer wastes money as the pasture plants cannot effectively use added nutrients if the pH of the soil is too acidic or basic. This is one of many examples, which could extend to calculating an appropriate amount of feed to order each quarter, which requires knowledge of how much a horse should eat daily based on their body size, arena management techniques that reduce the concentration of dust and airborne contaminants causing lung inflammation in horses (and humans), and drug dosage rates based on body weight.

For this class, students will develop a facility management plan with multiple components. Existing components include a pasture rotation plan, a fencing plan, and a plan for ordering feed and bedding. We will expand this to include estimating startup costs, setting prices for income generating activities (horse sales, horse training, etc.), and developing a cash flow budget so students can plan for large expenses, such as quarterly feed orders. Our goal is to modify this course such that each component of the plan is preceded by one or two lectures that provide the necessary baseline information of each plan component. For example, how to use a soil analysis to calculate fertilizer rates. These lectures will be followed by one day of group work where students apply the lecture material to develop a rough draft of their plan component.

Students value math skills when they see the practical application of those skills and how math competency will directly affect their objectives and career goals. Every component of the facility management plan will involve a real-life agricultural example that requires a calculation. For many of

these, we can also include physical examples to support the context. For instance, when calculating how much feed to purchase, students can physically weigh out feed at our barn and set out a week's supply to test that their calculations were correct. Other examples include that they can measure a stack of hay and use this to calculate the area required to store a quarter's supply. One of our goals is to increase student confidence in math skills through repetition. Although the example may be different each week, the mechanism to solve the problem will be very similar. Anecdotally, we have seen that reinforcing math skills in our graduates has had a positive impact in the small businesses that they tend to start and run. This project will involve a new collaboration between Equine Science and Agricultural Business faculty, which will add finance and accounting content of the course. These additions will increase the variety of calculations and real life math examples that students will be exposed to during the course.

Our objective for this project for the upcoming semester is to add in several facility management plan components. These components will include 1) selecting a plot of land that is for sale, 2) laying out a pasture plan on the selected land that includes a type of fencing and linear footage, 3) a pasture fertilization and management plan, 4) an arena management plan, 5) a manure management plan, 6) a purchasing plan for feed and bedding, 7) expected startup costs, 8) projected income from the activities of their proposed business, and 9) a 12 month cash flow budget. We will then assess learning outcomes on these assignments in order to determine where we need to strengthen the curriculum in future semesters. We will employ an agricultural business undergraduate or graduate student with a strong math and finance background to hold office hours in order to provide preliminary feedback on rough draft calculations.

Materials and Methods

The introduction of new facility management plan components will occur during the spring 2021 offering of this course. We will review student learning outcomes and develop new lecture content during summer 2021. The course will be submitted to Academic Affairs during the 2021-2022 academic year and will be offered bi-annually thereafter. For this project, we will purchase calculators and dry erase markers for student use during group meetings. We will also purchase laminator sheets for making disposable white boards. Particularly during spring 2021, group meetings may occur outdoors or in socially distanced classrooms, therefore we will supply bright colors that can be viewed from a distance.

Expected Results and Dissemination Plan

We expect that using real life agricultural examples will increase students' confidence in their abilities to perform mathematical calculations necessary for conducting equine businesses. We also expect that at least 70% of students will score a 70% or greater on all areas of the facility management plan rubric. We plan to collect and disseminate this data at the North American Colleges and Teachers of Agriculture conference during the summer of 2022, with later publication in the NACTA journal.

Budget and Justification

- 10 Texas Instruments BA II Plus Financial Calculator (\$31): \$310
- Scotch thermal laminating pouches pack of 200 (\$28): \$28
- 10 sets of dry erase markers (\$4): (\$40)
- 10 pouches for pens and calculators (\$3): \$30
- Teaching assistant (spring 2021): \$500
- Faculty Stipends (summer 2021)
 - Bedore, PI: \$500
 - Wolfskill, Co-PI \$500

Total: \$1908