

Developing Enthusiasm and Improving Student Evaluations for a Required Technical Course

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Modification of teaching techniques in a required technical course can greatly affect student attitude and evaluations of the course. Changes in the organization and teaching techniques of a Dairy Anatomy and Physiology course at The Ohio State University Agricultural Technical Institute were instituted due to peer and student evaluations. Modifications consisted of improved integration of course material, improved specimens for student examination, smaller discussion groups, improved instruction, and decreased turn around time of assignments. Although there was little change in course content, these modifications resulted in markedly-improved evaluation ratings of the course and instructor. Instructors, especially of required technical courses, need to be willing to change techniques to encourage students to be positive about courses and learning experiences.

Students must complete certain courses to fulfill the requirements for a degree. There are some courses in which the student would otherwise not enroll and it is a challenge for instructors to stimulate student interest in such required courses. In this article, results are presented that illustrate the effect of improved teaching techniques on student attitude and evaluation of a required technical course.

Course Background

Students with a major in Dairy Production and Management at The Ohio State University Agricultural Technical Institute, a two-year associate of applied science program, are preparing for careers as dairy herdsman and managers. They are required to enroll in Dairy Anatomy and Physiology during their second quarter. This course is a prerequisite for later dairy courses. The main objective of the course is for students to understand the structure and functions of the various organ systems of dairy cattle. It is a four credit hour course consisting of three one-hour lectures and one two-hour laboratory each week. General biology is a prerequisite for the course.

Student Evaluation

At the end of the quarter, each student is asked to complete a written evaluation of the course and instructor. The first part of the evaluation includes a series of questions in which students select a response from the following 5 categories: strongly agree (+2), agree (+1), neutral (0), disagree (-1), strongly disagree (-2). The second part of the evaluation allows each student to make written responses in support of the current methods and/or statements concerning course improvement. Course modifications and techniques are based on these evaluations. Stufflebeam (1987) re-

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viewed several studies and concluded that students are valid and reliable evaluators of teachers and course activities. Braskamp et al. (1983) presented evidence that students are reliable evaluators of how the teacher communicated and what they learned but were not the best judges of subject matter relevancy or the professor's knowledge. Seykora and Drees (1990) found that the clarity of presentation, instructors' attention to what helps students learn, and instructors' success in getting students interested were items that ranked high in importance for student ratings of teachers.

Teaching Technique/Course Changes

All lectures and laboratories for this course have been taught by the same instructor for 3 years. Lectures and laboratories are organized to separately discuss the body systems (i.e. muscular, digestive, reproductive, etc.) of dairy cattle. Overhead projections of lecture outlines and descriptive figures plus the use of the chalk board, verbal examples, and simple analogies are used to clarify the technical information presented. Students are encouraged to ask questions. As a result of student evaluations, the instructor has made significant changes in teaching techniques over the past 3 years, especially in the laboratory. The greatest changes were made after the first year.

Laboratories are designed to complement lecture material. Lectures and laboratories are synchronized throughout the quarter to encourage continuity. There are 9 written laboratory assignments designed to encourage students to investigate displays (specimens, experiments, microscope stations) in the laboratory, to use their textbooks to search out explanatory information, and to support lecture presentations. Students must analyze and interpret information when completing the laboratory assignment. Newcomb and Trefz (1987) stressed the importance of students being involved in decision-making and evaluation type learning activities to encourage them to operate at higher levels of cognitive learning. On the average, each laboratory assignment requires approximately 4 to 5 hours of student effort.

Changes have occurred in the laboratories during each of the 3 years of development.

Year 1: Table 1 contains a summary of the traditional laboratory activities for year 1. Students were expected to observe and experiment with laboratory displays and write down their observations. They were then required to describe how and why the dairy cow's body functions as it does. Some discussion questions related to the application of these principles to dairy cattle production and management. Laboratory assignments were due one week after the laboratory. Several weak areas in the first year program were identified. (1) In general, the students were not interested in histology or even in using the microscope. Since

Table 1. Summary of Dairy Anatomy and Physiology Laboratory Activities During Year 1

Lab Topic(s)	Main Student Activities
1 Histology, Embryology, Terminology	Reviewed or discovered the histology of the main tissue types, embryology, and pertinent course terminology.
2 Animal Behavior	Investigated animal behavior, did a heifer social dominance trial, and discovered how social dominance might be used in production management.
3 Skeletal System	Studied a cow skeleton, individual bones, and preserved joints.
4 Muscular and Nervous Systems	Student groups used purchased muscle kits to demonstrate the effects of ATP, salts, and the combination of ATP and salts on muscle contraction. Preserved eye, brain and spinal cord preparations were displayed. Pairs of students worked together to study the effects of various stimuli on reflexes (pupillary, knee jerk, etc.)
5 Circulatory and Respiratory Systems	Preserved hearts on display. Fresh heart and lung/trachea specimens were obtained from a slaughter house. Parts of these organs were examined and the lungs were inflated and deflated to simulate respiration.
6 Digestive System	Fresh cow esophagus/stomach dissection demonstration and an artificial rumen set-up. Fresh rumen fluid was obtained and placed with substrates (sugar, grain, hay) in a warm water bath to investigate the amount of gas production.
7 Male Reproductive System	Fresh and preserved bull reproductive organs and sperm were observed.
8 Female Reproductive System	Fresh and preserved cow reproductive organs, placentas, and fetuses were investigated. Fertilization, implantation, and parturition discussed.
9 Urinary and Endocrine System	Fresh and preserved urinary and endocrine specimens were dissected and explained.

this was the main activity of the first laboratory, the course started off somewhat negatively. (2) Since body systems were studied individually, students lacked an understanding at the completion of the course of how the various systems fit together. (3) Students were not as interested in preserved specimens, especially non-dairy specimens, as they were in fresh, dairy specimens. (4) The number of students in the laboratory was too large to work effectively with individual student needs and for students to easily view demonstrations. (5) Students were not prepared for the laboratory although the topic was listed in the syllabus. (6) Students were involved with "3 labs" most weeks (the returned graded lab assignment, the lab assignment due and the lab exercise and assignment for that week).

Year 2: Changes were made in the laboratory organization to encourage student interest without decreasing the rigor or general content of the course (See Table 2). Improvements made during the second year seemed well received. However, the following weak areas were identified: (1) Inadequate understanding of the purpose of Laboratory 1. (2) Excessive class size to allow adequate student-instructor interaction.

Year 3: The new laboratory 1, observing the calf and

describing the organization and function of various organ systems needed more modification. Students were confused as to how to discuss the systems. This part of the exercise was put into table form and a clearer description of the exercise was provided. Two laboratory sections were created for the course with a different calf for each section. This allowed a smaller group size for demonstration and individual assistance.

Analysis Of Data

Analysis of variance was used to identify differences among years for each of the 11 student evaluation questions. T-tests were used to identify differences in question means between paired years. SAS (Statistical Analysis System Institute, Inc., 1985) GLM, LSM, and p diff. procedures were used.

Means and standard deviations for the 11 evaluation statements and the overall means and standard deviations for the 3 years are presented in Table 3. The selected questions relate to the effectiveness of the instructor and classroom methods. Table 4 contains representative written student evaluations. The average class grades for the 3 years were C-, C, and C-, respectively.

Although the same instructor taught the course and presented essentially the same material, significant (P<.05) improvement in student attitude and course evaluation rat-

Table 2. Summary of and Rationale for Changes in Dairy Anatomy and Physiology Laboratories for Year 2.

Change	Rationale
Fresh stillborn calf obtained for use in Laboratory 1.	Dissection demonstration/explanation to allow observation and discussion of the association of body systems before each was studied individually. Course initiation in a more exciting manner.
Laboratory 1 assignment included a written description of the size, shape, and location of the various organs and tissues important for organ functions.	Exposure to the course and textbook.
Following Laboratory 1, calves were divided according to body systems and were then frozen.	As systems were studied in later laboratories, appropriate calf parts were thawed to complement individual organs obtained from the slaughter house.
Most laboratories included some histological slides.	Integration of the various types of tissues from a functional viewpoint. Decreased student anxiety associated with one microscopic laboratory.
Students divided into 2 groups for demonstrations.	Allowed smaller group size for observations and discussion.
Laboratory exercises received one day before the laboratory.	Allowed students to prepare for and/or start completing the exercise.
Assignments due 5 days after the laboratory.	Assignments could be graded and returned for discussion one week after the exercise. Laboratories better synchronized with lectures.
	Students were only involved in a review of the previous week's laboratory and the new exercise.

Table 3. Mean Values of Student Responses Toward Dairy Anatomy and Physiology

Question	Statement	Mean (SD) ^a			F	P ^b
		Year 1 (n=16)	Year 2 (n=26)	Year 3 (n=29)		
1	The instructor was well-prepared for class	+1.5 (0.5)	+1.9 (0.3)	+1.9 (0.3)	8.30	<.001
2	The instructor had a thorough knowledge of the subject.	+1.5 (0.5)	+1.8 (0.4)	+1.9 (0.3)	7.33	.001
3	The instructor communicated his subject matter well.	+0.7 (0.8)	+1.7 (0.6)	+1.6 (0.6)	12.57	<.001
4	The instructor stimulated interest in the course subjects.	+0.4 (0.8)	+1.4 (0.5)	+1.5 (0.6)	18.03	<.001
5	Presentations were well-organized.	+1.1 (0.4)	+1.7 (0.5)	+1.7 (0.5)	12.38	<.001
6	Instructor encouraged questions/discussion in class.	+0.2 (0.9)	+1.3 (0.6)	+1.4 (0.8)	15.33	<.001
7	Instructor made effective use of visual aids.	+1.1 (0.6)	+1.6 (0.5)	+1.6 (0.6)	4.16	.02
8	Experiments/exercises were important supplements to course	+1.2 (0.4)	+1.5 (0.6)	+1.7 (0.6)	3.96	.02
9	Instructor seemed interested in course material	+1.3 (0.4)	+1.6 (0.5)	+1.7 (0.5)	4.43	.02
10	Teaching methods used were appropriate for this course	+0.9 (0.4)	+1.4 (0.6)	+1.6 (0.7)	5.51	.006
11	The overall teaching ability of the instructor was high	+0.9 (0.5)	+1.8 (0.4)	+1.8 (0.4)	24.34	<.001
Mean and Standard Deviation for All Evaluation Statements		+0.9 (0.7)	+1.6 (0.5)	+1.7 (0.6)		

^a +2 = strongly agree, +1 = agree, 0 = neutral, -1 = disagree, -2 = strongly disagree

^b Means for all questions except question 8 were lower (P<.05) in Year 1 than Year 2. Means for all questions were lower (P<.05) in Year 1 than Year 3.

Means for all questions did not differ (P>.05) between Year 2 and 3.

ings were obtained with little change in course rigor following the changes in the laboratories after the first year. The new Laboratory 1, the calf dissection demonstration, stimulated interest in the individual body systems which would be studied in detail later, and also proved to be an organizer of the overall course material. By incorporating histological slides throughout the laboratories rather than just during the first laboratory reduced student anxiety at the beginning of the course and increased student enthusiasm. The acquisition of various fresh organ systems, especially from cattle, helped maintain interest by demonstrating more closely how the systems would appear in the live animal. For example, preserved brain and spinal cords are usually firm and molded. Fresh brains and spinal cords are very soft and easily crushed. Decreasing the group size during demonstrations allowed students to better observe the specimens

Table 4. Summary of Written Student Evaluations of Dairy Anatomy and Physiology

Year 1

- Took too many notes...this made the class boring, although it isn't an interesting class to begin with.
- Most of the information was more in-depth than needed -- some things applied to someone who wants to be a veterinarian instead of a dairy farmer.
- Classes and labs were enjoyable...some labs were difficult.

Year 2

- The material covered was useful as well as interesting and helped me understand how the body functions and the purpose of each body part.
- Labs were fun and informative. The actual parts could be seen and understood better than just using the text.
- I think the enthusiasm of the instructor of how the body works and its arrangement rubbed off on me and kept me interested and enthused about the class.

Year 3

- I feel the information and material covered is a must to learn and it was presented at a level that made it easy to understand.
- The instructor was good, organized, and showed many examples. We saw the parts of an animal. He went through each system carefully and showed us where they were in the body and what other organs affected them. The teacher kept you interested during labs.
- I think the material covered is valuable because it makes understanding other courses easier. It is easier to picture what happens inside the cow when the material is thoroughly covered. Excellent method of teaching.

and to ask questions.

Changes in the logistics of assignments improved organization and provided continuity to the course. By receiving the assignment before the laboratory, students could be aware of the laboratory plan for the day. Numerous students started answering the discussion questions before the laboratory. Topics were kept fresh in students' minds when graded laboratory assignments were more rapidly returned, i.e., the week following their completion.

No significant (P>.05) improvement in evaluations was determined from Year 2 to Year 3 although slight increases were observed in several means.

Conclusions

Providing innovative and effective instruction for the teaching of required technical courses is necessary to stimulate student interest and enthusiasm. The following modifications were effective in a Dairy Anatomy and Physiology course: (1) providing good observation materials and (2) planning small group sizes to allow students to better view, ask questions and understand the demonstrations.

Teachers must be sensitive to student attitudes and evaluations and be willing to change techniques to encourage student participation and interest. Technical courses can be a drudgery for both students and teachers. By being creative and sensitive, a teacher may promote a more positive attitude that will be absorbed by students in the course so students enjoy learning very technical information.

References

Braskamp, L.A., D.C. Brandenburg, E. Kohen, J.C. Ory and P.W. Mayberry. 1984. "Guidebook for Evaluating Teaching; Part II: Collecting Evaluative Information About Teaching (Student Ratings)." *NACTA Journal*, 28(1):19-25.

Newcomb, L.H. and M.K. Trefz (1987). "Toward Teaching at Higher Levels of Cognition." *NACTA Journal*, 31(2):26-30.

Seykora, T. and D. Drees (1990). "Factors Influencing Student Ratings of Faculty and Courses." *NACTA Journal* 34(3):23-25.

Statistical Analysis System Inc. (1985). *SAS User's Guide: Statistics*. SAS Institute Inc., Cary, NC.

Stufflebeam, C.E. (1987). "Validity and Reliability of Student Ratings of Professors." *NACTA Journal*, 31(4):35-37.

