

h after feeding. During periods 2 and 3, ISD kinetics were measured by incubating TMR samples in nylon bags for 0, 2, 4, 6, 8, 24, and 48 h and fitting an exponential model to the data. Mean ruminal pH was lower in cows fed EC (pH=6.02) than cows fed the Control diet (pH=6.29). Cows fed ETMR had lower ruminal NH₃-N and total VFA concentrations, lower acetic acid concentration and a lower acetate:propionate ratio than cows fed the Control diet. Cows fed EF also had lower (P<0.01) acetic acid concentration and higher (P<0.01) isovaleric concentration acid than those fed the control diet. Cows fed TS had higher (P<0.05) isovaleric acid than those fed the Control diet. Kinetics of ISD were unaffected by enzyme addition, except that the TS TMR DM tended to be degraded at a faster (P=0.107) rate than the Control diet. Enzyme addition to the TMR was the most effective method of improving ruminal fermentation

Key Words: Fibrolytic enzymes, Dairy cows, Rumen fermentation

497 Effects of feeding oxidized fat supplemented with antioxidant AGRADO on rumen nutrient digestibility and protein synthesis.

M. Vazquez-Anon^{*1}, J. Andrews¹, T. Webster², and T. Jenkins³, ¹Novus International, St. Louis, MO, ²West Virginia University, Morgantown, ³Clemson University, Clemson, SC.

A dual effluent continuous culture system was used to investigate in a 2 x 2 factorial design the effect of feeding fresh (FF) or oxidized

fat (OF) when supplemented with or without antioxidant on nutrient digestibility and bacterial protein synthesis. Twelve fermenters were fed twice a day for 9 days a diet that consisted of 48 % grain mixture and 52 % forage that contained 3% (DM basis) FF or OF blend of unsaturated fats (33% fish, 33 % corn, and 26 % soybean oil and 7 % inedible tallow) and supplemented with 0 or 100 ppm of AGRADO[®]. OF contained higher concentration of peroxides (215 vs 3.5 meq/kg), and lower EPA (C20:5; 3.6 vs 5.1%) and DHA (C22:6; 1.7 vs 2.4 %) than FF. Feeding OF reduced CP digestibility (P = 0.009), microbial N yield (P < 0.03) and efficiency (P =0.03) when compared to FF. Adding Agrado improved total CHO (P=0.05), NDF (P=0.02) and ADF (P=0.04) digestibility, non-ammonia-N (P =0.008), microbial N yield (P=0.08), and the amount of digested feed N converted to microbial N (P=0.01), and reduced ruminal ammonia-N (P=0.008). From this study it can be concluded that feeding OF reduced CP digestibility and microbial protein synthesis and efficiency. The negative effect of feeding OF on rumen fermentation was corrected in the presence of Agrado. In addition, Agrado improved fiber digestibility in the presence of both types of fat.

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Key Words: Oxidized fat, Antioxidants, AGRADO

Teaching/Undergraduate and Graduate Education

498 Comparing vocational agriculture and non-vocational agriculture student success on high stakes testing. D. Ritenour* and D. Nash, *Ferrum College, Ferrum, Virginia.*

The purpose of this study was to determine if participation in vocational education courses has an effect on high-stakes test scores, namely the Virginia Standards of Learning (SOL) exams. Previous research indicates that students with vocational concentrations did not score significantly higher or lower on high-stakes exams. For this study, data for 400 students from a semi-rural high school in southwestern Virginia was collected. Variables included gender, SOL scores, agriculture course participation (ACP) and cumulative grade point average (GPA). The ACP data represents the number of agriculture courses, including animal science, the student participated in grades 9-12. The SOL scores are on a scale of 400 to 600 and include the content areas of algebra, geometry, world and US history, earth science, biology, chemistry, reading, and writing. Students are required to take SOL tests until they achieve a passing score of 400. However, no more than five students were required to re-test for any SOL test. The GPA data was given on a 4.0 scale, though 69 cases exhibited a GPA above 4.0 due to weighted credits on advanced placement courses. The SOL scores were regressed on GPA, gender, and ACP. Standardized coefficients for ACP for math (average of algebra and geometry), history (average of world and US history), science (average of earth science, biology and chemistry), reading, and writing scores were .231, .205, .263, .225 and .217, respectfully, and were each significant at the .0001 level. The positive coefficients indicate that as students' participation in agriculture courses increases their SOL scores increase as well. These results show the positive effect agriculture course participation appears

to have on students' success on high-stakes testing, but also makes a valid argument for the continuation of vocational agricultural education in the public school system. On the undergraduate and graduate level this research should be important to teacher educators due to the fact that the role of the agricultural educator, as well as educators in general, is swiftly changing to meet the needs of high-stakes testing.

Key Words: Vocational, High-stakes, Education

499 Collegiate LifeKnowledge: A student-centered leadership development program. C. M. Wood*, *Virginia Polytechnic Institute and State University, Blacksburg.*

Collegiate LifeKnowledge (CLK), a leadership curriculum developed for members of collegiate agricultural student organizations, is an initiative of the National FFA Organization in partnership with the John Deere Corporation and CSREES. Collegiate LifeKnowledge was initiated and developed by stakeholder groups that included students, educators, student organization representatives, and industry representatives. A taskforce met in January 2005 to identify the direction of the project, followed by a writers' meeting in February. Lessons that focused on four facets of leadership—Personal, Organizational, Career, and Community—were completed in June. The lessons were developed to be taught by college students to college students—no lectures allowed. Each lesson can be taught in 15, 30 or 45 minutes and is divided into four parts. Part 1 gives the student leader all the logistical information related to the lesson. Part 2 has all the background information necessary to become an instant expert for

presentation of the lesson. Part 3 is an action plan, and Part 4 has all the required materials, handouts, activity sheets, etc. In September, CLK was released at an inaugural training event. Preliminary results from the 2005 National FFA Convention suggest that students have embraced the curriculum and are actively utilizing it. Industry leaders such as John Deere, Kraft, and Monsanto each have programmatic buy-in to CLK and stand to benefit from well-prepared individuals who will constitute their future labor force. Based on the success of this project, the 16 organizations originally involved in the development of CLK have since formed the Consortium of Collegiate Agricultural Organizations. This consortium offers member organizations the opportunity to share resources, offer a consistent leadership message to students, avoid duplication of efforts, and satisfy individual organization needs. At its first meeting, the consortium developed seven strategic action plans that include advisor training and developing career opportunities for students.

Key Words: Undergraduate education, Leadership development, Careers

500 Objective assessment of critically thinking ability of animal science undergraduates through use of the *Watson-Glaser Critical Thinking Appraisal*. I. P. Shann*, C. C. Carr, and E. P. Berg, *University of Missouri, Columbia*.

Employers of animal science graduates seek applicants possessing a strong base of knowledge balanced with the ability for independent thought and critical thought. The objective of this study was to quantify critical thinking skills of students enrolled in the Fall semester 2006 *Live Animal and Meat Evaluation* course. This course addressed animal anatomy, live animal evaluation and pricing, carcass grading, carcass pricing, and ranking philosophies for beef, pork, and lamb. The *Watson-Glaser Critical Thinking Appraisal* (WGA) was developed as a means to objectively quantify improvements in the ability to think critically. The WGA served as our means of assessment to meet the objective of this study. On the first day of class, half the students received Form A of the WGA and the other half Form B. The students that completed Form A on the first day of class completed form B on the last day and vice versa. A total of 63 students completed both forms of the WGA. The WGA has an Overall score of 80, yet it is divided into five subsets; 1) Inference, 2) Recognition of Assumptions, 3) Deduction, 4) Interpretation, and 5) Evaluation of Arguments. After 16 weeks of instruction, students significantly improved in all five categories of the WPA. Higher ($P < 0.001$) Overall scores were recorded from the first (Avg. = 39.9; SD = 4.3) to the last (Avg. = 55.5; SD = 8.9) day of the semester. Improvements in WGA scores over the semester did not differ across final course grades revealing that A, B, and C students improved ($P = 0.759$) their critical thinking ability in a similar fashion. Pearson Correlation Coefficients were run comparing the species section exams with the Overall and the five subunits of the WGA. The Lamb ($P = 0.015$) and Beef exam ($P = 0.015$) were the only parameters associated with the end of the semester WGA Deduction score ($r = 0.307$ and 0.305 , respectively). We find that the WGA is an effective means to quantify critical thinking of undergraduates. Furthermore, final course grade does not appear to be an indication of ability to improve critical thinking skills.

Key Words: Critical thinking, Undergraduate, Watson-Glaser

501 Student perceptions and performance when animals and animal specimens are used in an introductory animal science class. M. S. Nemechek and W. L. Flowers*, *North Carolina State University, Raleigh*.

Laboratory practical scores, responses to survey questions, and attendance at laboratories and help sessions from first semester freshman ($n=721$) between 2000 and 2005 were used to evaluate the educational value of animal and animal specimens in an introductory course. The course consists of 3, 1-hour lectures and 1, 3-hour laboratory each week. Two laboratory practical examinations are administered during the course. Practical 1 (P1) covers basic anatomy and uses fresh and preserved specimens. Practical 2 (P2) covers animal handling and behavior and uses live animals. Students receive a course CD with pictures and video footage covering all aspects of each laboratory. Prior to each practical, optional help sessions are offered in which animals and animal specimens are used. The assumption was made that the content on the course CD was the main way students who missed laboratories and chose not to attend help sessions learned laboratory subject matter. Students that missed one or more laboratory and did not attend help sessions ($n=105$) had lower ($P < 0.01$) practical scores (-12 points) than their counterparts with perfect attendance. All of these students felt attending laboratories and help sessions would have improved their grade. Of the students with perfect attendance in laboratories ($n=616$), 405 and 259 participated in help sessions associated with P1 and P2, respectively. Attendance at help sessions for P1 did not affect scores ($P=0.30$). However, 98% of students thought it did. In contrast, attendance at help sessions positively affected test scores (+8 points) for P2 ($P < 0.03$), yet only 78% of the students felt it was beneficial. Overall, use of animals and animal specimens enhanced the learning environment for first semester freshman. However, their use appeared to be more critical for topics dealing with live animals as opposed to animal specimens. Finally, students are of the opinion that use of animal and animal specimens are beneficial even in situations where there was no statistical improvement in test scores.

Key Words: Alternatives, Animals, Teaching

502 Dynamics of how students earn their final course grade in an introductory course. W. L. Flowers*, *North Carolina State University, Raleigh*.

Final grades in most courses are the sum of repeated observations on student performance. Thus, students have opportunities to make adjustments in study habits during a course. The objective of this study was to characterize the dynamics of how students earn their final course grades. Data from first semester freshman ($n=938$) in an introductory class between 1998 and 2005 were used. The final course grade was based on 600 points generated from: 4 quizzes (Q1-4); 2 lecture examinations (LE1-2); 2 laboratory practicals (LP1-2); and a final examination (FE). For quantitative estimates, survival analyses were used and assumed that each student began the semester with 600 points. This total was reduced as points were lost on each assignment. For qualitative estimates, polynomial regression analyses were used to evaluate changes in a student's current letter grade after the completion of each test. For students with an A+ ($n=12$), there was no change over time ($P=0.40$) in their grade and the points lost on each assignment were consistent ($P=0.37$). For those with an A, most (25/33) had an A- or B+ for the first two-thirds of the course and their grade increased ($P < 0.05$) during the last third. They lost fewer ($P < 0.05$) points on LE2 or FE than on previous tests compared with students that earned lower grades. For students receiving an A- ($n=89$) or a B+ ($n=120$), there

were two distinct patterns. Students either performed poorly ($P < 0.03$) on the LE1 or LP1 compared with subsequent tests and their grade increased ($P < 0.01$) as the semester progressed or their grade after LE1 and LP1 was an A and it decreased ($P < 0.05$) because their scores on tests progressively got worse ($P < 0.01$). The most common pattern for grades lower than a B+ was for student performance and grades to decrease as the semester progressed. In conclusion, there is considerable variation in how students earn their final grade, but most prevalent pattern was for performance to decrease as the semester progressed.

Key Words: Dynamics, Grades, Teaching

503 Assessment standardization of hands-on skills in equine studies courses. K. I. Meek* and R. E. Marean, *Midway College, Midway, KY.*

Measurement of objective-based learning of hands-on skills in Equine Studies courses is confounded by grading subjectivity and horse behavior. Although breed associations define judgment of riding skills, there is no national regulating organization for standardizing performance of hands-on skills. The objectives were: define standards for performing hands-on skills, provide valid student assessment using criterion-based evidence, reduce grading subjectivity, and engage students in procedural learning. Rubric development was accomplished by determining appropriate skills for each riding maneuver or hands-on skill, disaggregating each task into simple steps, scoring the tasks, and developing criteria for each step. Reliability and validity was defined by descriptive and systematic categories, clear differences in scoring of each step, and well-defined objectives. Functional use of the rubrics was determined by voluntary surveys of the raters. The first performance rubric was developed for use by Equine Studies faculty (FC; $N=5$) to assess a showmanship pattern and turnout of 57 first-year students (FY). All FC expressed that the rubric was useful and decreased discrepancies between raters. Western riding skills rubrics ($N=27$) were then developed. Internal standardization of riding skills enhanced student learning ($N=5$) by providing clearly defined assessment of critical points on which students could re-focus practices post-assessment. A total of 15 second-year (SY) students developed a rubric for injury bandages and assessed the FY performance of bandaging techniques. The SY (85%) students indicated that rubric use would reduce subjectivity in evaluating skills, and SY (90%) thought student success would be enhanced by providing the tool prior to assessment. Performance rubrics aided students in linking learning outcomes to skills and engaged students by providing focus on concrete evidence for skill performance. Further, hands-on skills rubrics standardize student assessment and can account for unpredictable horse behaviors that would traditionally affect student grading.

Key Words: Hands-on skills, Rubric, Assessment

504 Costs, benefits, and publics: Training undergraduates to interpret a broad scope of implications from using genetic technologies in food animal production. C. W. Ernst*¹ and S. C. Ernst², ¹*Michigan State University, East Lansing,* ²*The Ohio State University, Columbus.*

Training students in concepts and techniques of molecular genetics has become a standard part of Animal Science curricula. However, courses generally do not emphasize how these technologies are marketed to livestock breeders or, more critically, how they are positioned with end-product consumers. Graduates are likely to be faced with explaining their impact, risks and benefits to less knowledgeable and

increasingly skeptical clients or members of a broader public. While the scientific bases are frequently well covered, potential controversies and market implications of their adoption are not. This omission is most evident when real or perceived negative events create news and resulting market shocks felt by large sectors of the livestock industry. Thus, we incorporate concepts of economic value and understanding the policy implications of public reaction to genetic technologies into our undergraduate courses in animal genetics and livestock marketing. A collection of techniques is used to expose students to divergent positions and train them to anticipate all sides in a debate, thus preparing them to be better business and scientific leaders. Classroom activities include case studies analyzing a firm's market-facing position and the potential implications of a technology-driven spike. Group discussions and debates are used along with Socratic dialog to probe the implications of the science. Debates designed as role play simulations with students assigned to portray viewpoints of various stakeholders include topics such as DNA marker testing, patenting of DNA markers, animal cloning, genetic preservation and various disease-related issues. Additionally, students monitor industry and commercial media sources for news items related to such issues and lead class discussions on the implications. Similar discussions occur online using computer-mediated forums. This combination of approaches prepares students to interpret a broad scope of implications from using genetic technologies in food animal production.

Key Words: Undergraduate education, Genetic technologies

505 Teaching societal issues facing animal agriculture: A writing intensive course for sophomores. J. N. Spain* and G. W. Jesse, *University of Missouri, Columbia.*

Students in Animal Science at the University of MO have less direct experience with production animal agriculture. These future graduates need to have a comprehensive view of the contemporary issues facing animal agriculture. Therefore, a course was developed to address this growing disconnect while meeting a campus-wide general education requirement. According to the General Education Architecture of the University of Missouri, the graduates: must be able to grasp the meaning of problems that go well beyond their academic major; will develop computing and information literacy; and will learn to reason well, to recognize when the reason and evidence are not enough, to discover the legitimacy of intuition, to subject inert data to the probing analysis of the mind. These general education goals are central to the structure and the purpose of this course. This course is designed to help each student understand the far-reaching nature of issues facing the future of animal agriculture. These issues will impact animal agriculture and all of society during their careers. These issues are often associated with strong emotions of all those engaged in the debate. The goal of this course is to help the students develop a fundamental understanding of key issues presented by both sides that are the foundation of the debate. During this process, the students develop computing and information literacy skills associated with electronic literature searches. The search for diverse sources of information help students gain a more comprehensive understanding of the issues. Furthermore, students communicate this understanding through a number of writing assignments. These assignments are formatted to help students continue to develop strong writing skills. A key component is a comprehensive research paper developed individually by each student. The research paper addresses the key components of a societal issue facing animal agriculture. Through review of published scholarly works, in-class discussions and writing, students develop and improve critical thinking skills.

Key Words: Contemporary issues, Seminar, Writing intensive

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