

fed on the wheat + 20% CM diet had higher G:F ratio compared with those fed on the corn-SBM diet (0.95 vs. 0.79, $P < 0.01$) during phase 1. However, the corn-SBM diet had higher ATTD of CP and energy compared with piglets fed the corn+20% CM, wheat-SBM, and wheat+20% CM diets (96.6 vs. 89.0, 90.9, and 87.2%; and, 95.3 vs. 89.6, 90.8, and 86.9%, $P < 0.01$) during phase 2. In conclusion, results indicated that the composition of the main feed ingredients in the basal diet influences feed efficiency, likewise protein and energy digestibility when CM is included at 20% level without affecting voluntary feed intake and ADG.

Key Words: canola meal, diet composition, digestibility

TEACHING UNDERGRADUATE AND GRADUATE EDUCATION

1747 Increase in demand for hands-on instruction in animal science curriculum. R. Woiwode*, Colorado State University, Fort Collins.

In animal science programs across the United States, the fraction of undergraduate students that have livestock experience before entering college is diminishing. Students in many programs clamor for hands-on experiences with animals and livestock, as it is relevant to their program of study, and may provide a competitive advantage in applying to a veterinary program. An experimental course was proposed for two primary purposes; first to address the specific demand encountered in the Department of Animal Sciences at Colorado State University, and second to provide greater pre-employment training and experience in course development and instruction for a doctoral student wishing to pursue an academic path. With guidance from the department head, a course description, outline, and schedule were constructed and presented to the departmental curriculum committee. Upon receiving authorization for the course to be listed on an experimental basis, registration was made available to the first ten students to enroll. The three credit course consisted of two lectures per week and one lab. Students were guided through an introduction to classical behaviorism and ethology, moving on to species specific behaviors of the major livestock species. Information was presented first in lecture, and reinforced through lab exercises. In labs, students were introduced to concepts through expert demonstration of animal handling or management techniques, and then practiced the skill with close supervision. Students had several opportunities to increase their proficiency with specific skills before they were given a practical assessment. Students were assessed on their assimilation of lecture material through traditional written exams, as well as in class and take home quizzes. Evaluation of the course was conducted with questions

ranked in a 5-point Likert scale to assess student perceptions and effectiveness of the course to achieve university learning goals. Students felt this course was an important part of their academic experience, and indicated that the exposure to the livestock species and various sectors of the livestock industry they were exposed to in this course was an invaluable experience. Finally, students felt that the size of the class provided optimum opportunity for students to receive instruction, practice, and demonstrate proficiencies.

Key Words: hands-on instruction, livestock experience, livestock handling, proficiency

1748 Adding a student-generated summary of main points to a lecture as a learning tool in an advanced nutrition course. S. L. Hansen*, Iowa State University, Ames.

Learning-centered classrooms encourage students to focus on the thinking required to master a concept. Previous work has suggested that increasing the number of focused engagement activities such as Turn To Your Partner (TTYTP) within a class period enhances student retention of information in an advanced animal science course. The TTYTP activity allows at least 3 opportunities to think about the learning, as the student generates his/her own answer, discusses it with a partner, and participates in whole class discussion. Starting each class period with a defined set of learning outcomes provides focus to the lecture and provides an outline from which students can study. Similarly, a structured ending to a class period that includes a review of the most salient points from a lecture could be beneficial to student learning. Students in a senior level animal nutrition course ($n = 34$ students) were asked to generate overall summary statements at the end of lecture ($n = 23$ lectures in the semester). During the last 5 min of class, students were asked to compile summary points from the lecture using the TTYTP format. Students were given approximately 2 min to generate a list of 3 to 5 primary summary points from the day's lecture material or discussion. They were then allowed to work with a partner for another minute, and then brought back to group discussion. Students were held accountable for their learning by being called on at random to share what they and their partner had identified as a critical summary point for the day's material. This continued until all points were exhausted. Critical opportunities for student development included the opportunity for the instructor to correct misconceptions, and for students to develop better note taking and summarizing skills. Students gave feedback halfway through the semester and 80% specifically mentioned that summary point generation was a factor in class that positively affected their learning. Twenty-three students completed the final anonymous course evaluation, and 87% replied to the question "what helped your learning most in this class"? Of those replies, 100% indicated the TTYTP and summary exercise were beneficial in their learning. Including

a summary exercise at the end of each class was a positive addition to an advanced nutrition course and contributed to the success of students.

Key Words: learning, summary points, undergraduate

1749 Teaching animal welfare via competitive judging contests. C. B. Shivley^{*1}, F. B. Garry², and T. Grandin¹, ¹*Colorado State University, Fort Collins*, ²*Colorado State University, College of Veterinary Medicine and Biomedical Sciences, Fort Collins*.

The scientific study of animal welfare involves complex assessments of an animal's physical health, emotional state, and the naturalness of its environment. As the public becomes more aware of animal welfare, the demand for students knowledgeable about animal welfare science is increasing, yet many universities provide little training in this field. The Animal Welfare Judging and Assessment Contest (AWJAC) was created in 2002 at Michigan State University with support from Purdue University to teach students how to assess and critique the welfare of animals used for food production, research, companionship, and other human purposes. Each year at the annual competition, computer-based scenarios on four pre-determined animal species are presented to the students with information on performance, health, physiology, handling, and behavior of the animals. The students evaluate the scenarios to determine which facility has the best welfare, and defend their decision through oral reasons presented to judges. The competition now has undergraduate, graduate, and veterinary divisions. The 2015 competition was held at Ohio State University with 25 teams and 105 individuals competing. A course was created at Colorado State University (CSU) in 2012 to prepare students for the competition, and can serve as an example of how to teach students about animal welfare assessment. The course teaches students about general animal welfare principles, provides in depth training on the four featured species through guest lecturers, field trips, and review of the scientific literature, and develops public speaking skills. The CSU teams have continued to be successful at the contest, and in 2015 CSU won first place in the graduate division, as well as numerous individual awards. The contest combined with the course provides learning opportunities about the growing field of animal welfare science.

Key Words: animal welfare, judging teams, welfare assessment

1750 Integrated program for reducing bovine respiratory disease complex (BRDC) in cattle, coordinated agricultural project (CAP): Translation of multi-omics research results into teaching programs. M. G. Thomas^{*1}, R. M. Enns¹, R. Hagevoort², J. S. Neibergs³, A. L. Van Eenennaam⁴, H. L. Neibergs⁵, and J. E. Womack⁶, ¹*Department of Animal Sciences, Colorado State University, Fort Collins*, ²*New Mexico State University, Dairy Extension, Clovis*, ³*Washington State University, Pullman*, ⁴*University of California, Davis*, ⁵*Department of Animal Sciences, Washington State University, Pullman*, ⁶*Texas A&M University, College Station*.

Bovine respiratory disease complex is a common cause of morbidity and mortality in cattle, especially young animals exposed to stress. This disease is considered a complex because of numerous pathogens, environmental and management factors of the beef and dairy industries. Susceptibility to BRDC is also considered a complex trait as it is very polygenic. The general research objective of this CAP is to use genomic approaches to identify chromosome regions associated with susceptibility to BRDC. The genomic approaches described in the research publications from this CAP involve multiple types of data and results, such as genome-wide association and SNP-chip data, DNA and RNA sequencing, quantitative genetics and many physiological measures of the immune system. The results will be translated to beef and dairy industries via selective breeding tools and methods for disease prevention and management. These types of tools are known as genome-assisted EPD and PTA. A translational effort of research findings, which also includes cattle health and behavior results, is encompassed in multiple teaching and extension efforts described on this website: <http://www.brdcomplex.org/>. Examples of the genomic translational educational effort include the Herd Health and Breeding and Genetics modules within the U.S. Dairy Education and Training Consortium (USDETC) and two online graduate courses titled: I) Applied Disease Management for BRD and II) Genetics and Genomics of BRD in Cattle. Within these activities, students learn about the various types of omics data and how these data are used in the calculations of genome-assisted estimated breeding values. This CAP is now in its latter years of funding, and the research team is

successfully publishing results. Therefore, quality multi-omics information is available to teach students about various types of omics data and how these data can be used in genetic improvement programs for traits that are currently difficult to measure in beef and dairy production systems. In summary, the education component of the BRDC-CAP (USDA-AFRI 2011–68004–30367) involves cross-disciplinary learning opportunities that coincide with the multi-omics research of susceptibility to BRDC.

Key Words: cattle, genomics, respiratory disease, teaching

1751 A novel approach to adviser training for relational skills. *A. L. Robinson* and H. D. Tyler, Iowa State University, Ames.*

The Iowa State University College of Agriculture and Life Sciences Dean's Task Force on First Year Student Success recommended that workshops should be developed to enhance relational skills of academic advisers. The topic of the first workshop developed was "Student Issues: Recognition and Referral". In contrast to other workshops covering similar topics, this workshop incorporated undergraduate students that had overcome a variety of barriers to their success. We maintained a small interactive workshop approach, limiting adviser enrollment to 12 advisers per workshop and incorporating an equal (or greater) number of students. During the 3-hour workshop, participants discussed common barriers to assisting students during a brief presentation on common student issues, effective communication skills for advisers, and campus and community resources available for referral. In addition, students assisted in role-playing exercises designed to simulate adviser meetings with a student in crisis, and the session ended with a panel discussion allowing advisers to ask questions directly to any of the students or the session leaders. Over 50 advisers from across campus have attended these workshops, and the session was also replicated at a regional meeting of the National Academy of Academic Advising. Advisers attending these workshops provided feedback through a survey at the end of the session rating six different aspects of the workshop on a 1–10 scale. Ratings for each aspect of the program ranged from 8.5 to 9.2, with advisers rating the student panel and student role-playing as the most impactful aspects of the workshop at 9.2/10 and 8.8/10, respectively. These data suggest that relational workshops for advisers are more impactful when a student perspective is included. Adviser comments reflected that many advisers lack confidence in their ability to respond appropriately to a student in crisis, and that their confidence increased as a result of participating in this workshop. In summary, adviser participation in relational workshops that include student participants enhances adviser confidence in their ability to recognize student issues and respond appropriately and effectively; these skills ultimately should improve student

retention and success.

Key Words: academic advising, student success

1752 The effect of a real-world learning project on students' knowledge retention: A comparative study. *L. M. White*, New Mexico State University, Las Cruces.*

To be successful in many undergraduate disciplines, students must retain base knowledge from lower level courses and apply that knowledge in upper level courses. Students may benefit and realize the importance of mastering basic concepts from the opportunity to utilize base knowledge in a real-world setting. Objectives of this project were to compare students ability to retain information after completing a real-world learning project (RWLP) to base knowledge retained from exams students took during the semester, and finally to determine student's perception of the RWLP. Incoming freshmen ($n = 52$, 79% female, 96% animal science majors) enrolled in an introductory equine science course worked independently to create a RWLP, specifically an educational bulletin (EB) for eight main topics studied during the course. The main topics were identified by the instructors as the most important topics to learn in an introductory horse science class, and included: identification, behavior, health, nutrition, activities, hoof care, parasite/disease, and reproduction. Students completed two assessments after the course was completed, the regular course exam quiz (REQ) which contained questions ($n = 16$; 2 questions from each main topic) the students had previously completed on exams and the educational bulletin quiz (EBQ) which contained questions ($n = 16$; 2 questions from each main topic) that were generated by the instructors from each student's EB. Students also completed a 3-question survey (Likert scale 1–5) regarding the influence of the EB on their understanding of the material, retention of material presented in class, and overall impression of the EB. Student scores on the REQ and EBQ were correlated ($r = 0.54$ and $r = 0.39$, respectively) to final course grade, but not to gender ($-0.05 < r < 0.05$). Students performed better ($P < 0.0001$) on questions from the EBQ compared to questions from the REQ. Students indicated they enjoyed completing the EB and perceived that they better understood basic information and expected to better retain the material as a direct result (4.5 ± 0.1 , 4.72 ± 0.1 , and 4.5 ± 0.4 on a 5 point scale, respectively). Students benefited from completing the EB project by better retaining key concepts taught during an introductory equine science course and the project was highly thought of by students. Disciplines that require students to retain key concepts from lower level courses for later use in upper level courses could benefit from a RWLP like the EB.

Key Words: base knowledge retention, real-world learning project, undergraduate learning

1753 Utilization of concept mapping as a tool to qualitatively assess knowledge of college seniors in a companion animal management course.

C. L. Morris*, *Iowa State University, Ames.*

Concept mapping is a visual technique to facilitate integration of new information with previously learned material. This study was designed to evaluate the effectiveness of concept mapping as a novel method to qualitatively assess student critical thinking and understanding in a discussion-based senior level companion animal management course. Students over 3 semesters ($n = 106$) provided feedback after completing 9 total concept maps (3 per semester) following 3 main informational course units ($n = 318$ maps). A novel quantitative rubric was established, consisting of 3 categories each having 4 point levels, including Organization and Presentation, Content and Concepts, Knowledge of Concept Relationships, and Understanding Through Connections. Students completed the initial portion of maps before unit introduction and they were collected and held by the instructor (not graded) until the conclusion of the unit when they were returned to students for completion in a different color ink. Students were asked 4 anonymous questions about the maps using a standard 1–5 Likert type scale (1 = Strongly Agree and 5 = Strongly Disagree): 1) Concept maps made me think about information I already knew; 2) Concept maps helped me learn new material; 3) I liked Concept maps as an evaluation tool; 4) Concept maps were effective forms of assessment for this course. Additionally, students could submit comments regarding concept maps. A total of 87 of 106 students provided written feedback. Question score means were 1.27, 1.68, 1.45, and 1.55 for the four questions, respectively, and 94% of respondent comments were positive. Five students indicated they did not like the mapping activity and preferred essays or traditional exams. Sixty-seven percent of comments indicated maps improved learning because students were able to focus on how material specifically related to them and their existing knowledge base rather than worrying about stress of memorizing facts for exams. The words “less stressful” specifically appeared in 60% of written comments. This highlights the value of using concept mapping to develop critical thinking skills in a discussion-based class where traditional exams may not be effective. High rate of return of student feedback and consistency of positive responses from students underscore the value of this technique for qualitative assessment of knowledge and learning in a senior-level discussion-based companion animal course.

Key Words: companion animal, concept mapping, teaching

1754 Spanish for animal health and care: Toward a certificate program in field-specific Spanish.

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There is increasing awareness of the need for basic field-specific communication skills in Spanish on the part of animal science and veterinary professionals working with livestock operations. Between 80% and 90% of the workforce in such establishments is comprised of Spanish-speaking immigrants with low English proficiency and minimal formal education. Until now, the ways in which this language barrier has been approached have not been informed by the growing body of research on Languages for Specific Purposes (LSP). The objective of this presentation is to detail the interdisciplinary approach to the curriculum development and implementation of a basic “Spanish for Animal Health and Care” class leading to a certificate program designed to cater to the specific language needs of future animal scientists and veterinarians. The curriculum is based on a needs analysis, which includes non-structured interviews of Spanish-speaking workers on livestock farms and livestock farm professionals, the recording of a livestock workers’ safety meeting, as well as the creation of a specialized, domain-specific corpus. All course materials consist of module-specific packages of video and audio recordings, interactive hands-on materials, a library of relevant images, and a corpus of authentic texts, from which targeted vocabulary and grammatical forms are derived. The curriculum is divided into 3 performance-based units: describing and comparing animals’ physical and behavioral traits, mock-trainings of new hires wherein students describe the ‘why’ of farm procedures, and a mock-veterinary consultation which includes descriptions of abnormal animal behavior/physicality and recommendations for care. Formal mid-term assessments demonstrate increased development of functional language proficiency by indicating ascension on the American Council on the Teaching of Foreign Languages (ACTFL) proficiency scale from novice-mid toward novice-high. Communicative tasks that form the performance-based assessments require elaborated, context-specific sentence-length discourse, which is imperative for novice-high proficiency on the ACTFL scale. Informal student evaluations report gratitude and excitement about working toward field-specific functional proficiency in Spanish, which may factor into the current class average of 87.48%. Additionally, a survey completed by 257 students in CSU’s professional veterinary program revealed that 93.5% of students are interested in learning basic Spanish language skills specific to their future professional needs. 92.8% of those surveyed and 100% of students currently taking the beginner

Spanish course report that they would like to pursue a certificate program in Spanish for Animal Health and Care.

Key Words: curriculum development, languages for specific purposes, Spanish language proficiency

1755 Characterization of students' educational background and subsequent use of relevant teaching methods enhances student engagement and success in introductory animal science course. J. Adcock^{*1}, Q. S. Baptiste¹, and M. Knights², ¹Berea College, Berea, KY, ²West Virginia University, Morgantown.

One of the most challenging dilemmas a teacher faces when designing lessons for their class is the variation of prior knowledge of their students. This is especially true in introductory Animal Science courses, where students from a variety of backgrounds and knowledge levels are placed in the same course. Some of these students probably grew up around livestock or taken Animal Science courses in high school, while others may have never had these opportunities. In an effort to reach as many students as possible, teachers must either choose to cover the basics or start at the level of the majority of the class. The first option is best for those who do not have prior knowledge, but does not permit others to advance their education. The second allows advancement for some, but leaves others behind. Thus, a survey was conducted to characterize the educational background of potential Animal Science students and to determine adoptable teaching methods that were currently being used by agriculture educators in West Virginia and Kentucky high schools. Data revealed an even divide of the sexes (Male: 56.52 vs. Female: 43.48%) among participating students with 56.52 and 26.09% of whom live in rural non-farm and farm area, respectively. Most students enrolled in Animal Science class to be in Future Farmers of America (30.43%), to pursue agriculture/animal science career (34.78%), or were just interested in animal systems (26.09%). Weighted averages of students surveyed scaled responses (0 = least to 5 = most) indicated that the majority of students claimed they had the least amount of knowledge about abstract knowledge based topics of the digestive systems (3.77), nutrition (3.77), and genetics (3.83). Indeed, the surveyed teachers' responses also indicate that the most challenging topics to teach were nutrition and genetics. Teaching strategies that were reportedly most effective included, hands-on learning, project-based experiences, active learning experiences, and varying the speaker, technology, and interactions within the learning environment. Subsequent use of the foregoing information to modify an introductory Animal Science class with students of widely diverse educational background and experiences at Berea College resulted in increased (50%) student engagement and a significant increase (16.67%) in overall student satisfaction with the course as compared to when it was taught 2 yr prior.

Conclusively, the characterization of students' educational background and subsequent use of relevant teaching methods can enhance teaching effectiveness.

Key Words: educational background, teaching effectiveness, teaching methods

1756 Impact of a global food security assignment on agricultural sciences students' education and career interests. K. Matthews^{*} and O. Bolden-Tiller, *Tuskegee University, Tuskegee, AL*

As we approach 2050, the challenge of producing enough wholesome, nutritious food for the world population is of increasing concern. Although the solution has yet to be identified, it is clear that to address this issue a well-trained workforce that understands the issue of global food security and its causes is required. Therefore, this study sought to assess the impact of a global food security assignment on freshman animal science students' understanding of global food security and their desire to pursue careers that address this issue. To address this objective, 48 students majoring in animal science at Tuskegee University completed a Likert scale survey (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree) following the completion of a global food security writing assignment. The results of the survey indicated that after completing the global food security assignment, students had an increased understanding of global food security (4.3/5.0) as well as its causes (4.6/5). Before the global food security assignment, students indicated that they had not considered pursuing a career to assist with global food security (2.4/5.0); however, after the assignment, the students were more likely (3.5/5.0) to pursue a career that addresses global food security. These findings indicate that once students are educated about agro-issues, such as global food security, they are more likely to pursue educational and career opportunities that allow them to address said issues.

Key Words: food security, students, survey

1757 Student perspectives on agricultural study abroad programs. M. M. Beverly^{*}, S. F. Kelley, P. Urso, M. J. Anderson, J. L. Leatherwood, and K. J. Stutts, *Sam Houston State University, Huntsville, TX*.

The globalization of the US economy and agriculture products warrants agricultural programs to enrich the learning environment beyond agricultural systems in the United States, but to embrace international systems and markets, as well. International agriculture classes combined with study abroad programs have a positive effect toward students' understanding of global agriculture systems with a broadened cultural awareness. It is the study abroad experience that allows students to immerse themselves in cultural differences and obtain an understanding of different agricultural systems and policies governing food production in other countries. In the

summer of 2015, sixteen students from Sam Houston State University (62% female, 38% male, 20–24 yr of age) participated in pre-/post-surveys regarding a study abroad trip to France and Italy. In the pre-survey, 21% of the students predicted that the international experience would enhance their self-confidence/problem solving skills and on their return these characteristics increased to 40%. Students' predicted an increased knowledge in international animal regulations and practices and the post-survey verified that prediction by being 50% more confident in European Union (EU) animal agriculture practices, 62% more confident in EU animal welfare policies, and 62.5% more likely to have knowledge surrounding EU agriculture and animal organizations. When asked to if the study abroad experience increased their desire to travel abroad, 93% responded "very much". Only 2% would consider changing their academic major due to their study abroad experience. Students' responded overwhelmingly (100%) that they would recommend the program to a friend. Comments of students were: life changing, traveling with fellow students added to the experience, meeting people with the same passion for agriculture, and amazing, once in a lifetime trip. While there are many obstacles within study abroad trips, the expansion of knowledge for students is beneficial.

Key Words: international, study abroad, travel course

1758 Curriculum development for animal disaster planning. K. Franks, S. F. Kelley*, and M. M. Beverly, *Sam Houston State University, Huntsville, TX.*

Disaster preparedness is mandated by the federal government in the United States. Until the passing of the Pet Evacuation and Transportation Standards (PETS) Act in 2006, animals were not addressed in disaster planning except in the scope of livestock disease outbreaks and the need to protect our food supply. Disasters can be defined as "sudden-onset occasions that seriously disrupt social routines..." Hurricanes, tornadoes, wildfires, droughts, floods, severe blizzards, chemical spills, industrial explosions, and other incidents are types of potential disasters. Disasters can cause anxiety, depression, stress, and fear as well as financial strains and physical injuries for both human and animal. The cattle industry has a more than \$88 billion dollar a year impact, while the horse industry produces more than \$39 million a year direct impact on the U.S. economy. Companion animals are a vital part of our economy as well, with owners spending in excess of \$50 million a year on pets and their care. Society acknowledges the importance of the human-animal bond and its impact on mental health while studies have also shown the same effect on the mental health of animals during times of stress and separation from their owners. The Federal Emergency Management Agency (FEMA), a division of the Department of Homeland Security, provides information to understand disaster preparedness and implementation, while developing

curriculum to enrich agricultural program curriculum and education students on disaster planning and preparedness. Sam Houston State University has developed a course to address the need of the gap in education when dealing with these issues. The course focuses on risk assessment, to allow the student to learn the importance of focusing resources in strategic need areas and learn where mitigation efforts would be most beneficial. Topics also include: planning for mass die off and/or mass euthanasia, mass evacuation events, and a how-to plan for the evacuation and housing of companion animals, horses, and other types of livestock. This course provides a strong foundation on how to be prepared for man-made and natural disasters.

Key Words: agriculture, disaster planning, preparedness

1759 Application of a survey instrument for assessing student demographics and interests in an animal and dairy sciences career planning course.

M. C. Nicodemus*, *Mississippi State University, Mississippi State.*

Recent changes to the Mississippi State University Animal and Dairy Sciences (ADS) curriculum was designed to address the needs of today's students preparing to enter into the animal industry. The new curriculum includes the addition of a sophomore/junior level 1 h lecture course, ADS 2111 ADS Career Planning, focused on developing life skills needed for preparing for an animal science career. The course includes resume building and skill development in interviewing along with skills in job searches and preparation needed for building a strong background to impress potential employers. The course includes speakers and industry interaction along with career research activities and group discussions. To better develop and expand the new course, a survey instrument was applied to determine student demographics and interests. Students enrolled in both the spring and fall 2015 ADS 2111 ADS Career Planning course ($n = 58$) were asked to take a researcher-developed survey consisting of 10 questions compiled of both open-ended and forced choice questions. The majority of students taking the course were ADS majors (98%), and of those, over half (58%) were expecting to go to veterinary college, while 27% had expectations of attending graduate school. These ongoing degrees require a GPA of 3.0 or higher in which only 17% of the students in the course had a GPA below these requirements. As for practical industry experience, 88% of the students have performed an animal science internship or will be carrying out one in the coming semester. Over half of the students (54%) planned to focus their career in companion animals, including equine. ADS 1113 Animal Science was reported by 43% as being the most useful course taken at this point in their academic career. As for future courses, 39% reported the course they looked forward to most taking was the internship course,

ADS 4420 ADS Internship. As for the student's assessment of the ADS 2111 ADS Career Planning course and what activities they felt were the most useful, almost half (48%) reported the development of a resume and cover letter was the most useful in their academic career with 71% admitting they had not done a cover letter before the course. In conclusion, through the survey insight was given on what would be beneficial to adding to the course and what topics in the course are worthy of expanding according to the students' interests and background.

Key Words: assessment, career planning, demographics,

1760 Evaluation of learning outcomes in a dairy science section of a science, technology, engineering, and math retention program. K. A. Dolecheck* and J. M. Bewley, *University of Kentucky, Lexington.*

The mission of the University of Kentucky's STEMCats program is to 1) increase retention of STEM students, 2) increase awareness of non-traditional STEM careers, 3) create an opportunity for early exposure to research, 4) diversify the student population in STEM majors, and 5) increase faculty development. Freshmen students accepted into the program spend their second semester of the year-long program working with a research lab to gain hands-on experience. The objective of this study was to evaluate learning outcomes of students participating in the first dairy section of the program. Nine students with no previous research experience were enrolled in the Spring 2016 STEMCats dairy section. At the beginning of the semester, each student completed a nine-question survey that asked them to rank their understanding of different research aspects on a 1 (low) to 5 (high) Likert scale. The survey was re-administered either five ($n = 5$) or six ($n = 4$) weeks later. Based on a paired sample t test, understanding increased between the first and second survey in the areas of "how to design a research study" (mean \pm SD increase = 1.4 ± 1.2 points; $P < 0.01$), "understanding of statistical analysis" (mean \pm SD increase = 1.1 ± 0.8 points; $P < 0.01$), "how to create a research poster or presentation" (mean \pm SD increase = 1.6 ± 1.3 points; $P < 0.01$), "how to find research papers" (mean \pm SD increase = 0.9 ± 0.9 points; $P = 0.02$), and "how to analyze other's research" (mean \pm SD increase = 1.4 ± 1.5 points; $P = 0.02$). Understanding did not increase in the areas of "how to create and support/refute a hypothesis" (mean \pm SD increase = 0.7 ± 1.3 points; $P = 0.17$), "how to conduct a research study" (mean \pm SD increase = 1.1 ± 1.5 points; $P = 0.05$), "how to write a research abstract" (mean \pm SD increase = 1.1 ± 1.7 points; $P = 0.08$), and "how to explain research to others" (mean \pm SD increase = 1.1 ± 1.7 points; $P = 0.08$). Students in the STEMCats dairy section will re-take the survey again at the end of the semester to re-evaluate learning outcomes. These results can be used to analyze and adjust teaching methods for future

lab sections and can serve as an example to other universities considering similar programs.

Key Words: STEM, undergraduate education, undergraduate research

1761 Student assessment of curriculum efficacy in a beef systems management course. C. E. Andresen*, E. L. Lundy, D. D. Loy, and P. J. Gunn, *Department of Animal Science, Iowa State University, Ames.*

In 2013, a modified Delphi process was utilized to conduct a needs assessment and guide curriculum reconfiguration of the senior-level beef systems management course at Iowa State University. Stakeholders-guided assessment of course objectives was accomplished through a series of surveys designed to identify subject-matter areas in which beef students need to be proficient. The result was a list of 25 subject-matter areas that were emphasized when redesigning course curriculum. In no particular order, subject areas included: history of beef production, current events, advocacy, allied industry relationships, technology utilization, business planning, record keeping, economics/risk management, employee management, management of input costs, marketing, break-evens, health, nutrition, grading systems, calculating production costs, facility design, beef quality assurance, implants and feed additives, EPDs, grazing management, reproduction, beef interactions with environment, alternative business schemes, and use of beef-based software. The objective of this study was to evaluate how students' perceived importance and knowledge of these stakeholder-derived subject-matter areas changed as a result of the course. The subject-matter areas were presented to students in an anonymous survey at the beginning and end of the course for 4 consecutive semesters. Students were asked to rank the subject-matter areas in order of perceived importance (1–25; 1 = most important, 25 = least important) and indicate their perceived knowledge of each outcome (1–4; 1 = no knowledge, 4 = expert). Data were analyzed using the MIXED procedures of SAS. In both pre- and post-course surveys, students identified business planning as the most important subject and history of beef production as the least important subject in the course. Compared to pre-course surveys, end-of-course surveys ranked beef production history ($P = 0.01$) and current events ($P = 0.04$) lower. No differences were noted between pre- and post-course survey rankings of the other 23 subject-matter areas. As a result of the course, students' perceived knowledge was increased in 22 of 25 subject-matter areas ($P < 0.01$). Although numeric increases in knowledge were noted for history of beef production, allied industry relationships, and record keeping, students did not perceive a significant change in knowledge base for these areas ($P \geq 0.07$). Thus, a renewed emphasis will be placed on these areas in future semesters. These data indicate that the curriculum revision of the senior-level beef management course at

Iowa State University has been successful in educating students on stakeholder-guided course outcomes.

Key Words: beef, curriculum revision, survey

TEACHING UNDERGRADUATE AND GRADUATE EDUCATION SYMPOSIUM: ANIMAL SCIENCE EDUCATION IN THE CURRENT ENVIRONMENT

1762 Introduction to learning theories and implications for classroom design. M. Clement*, *Berry College, Mount Berry, GA.*

Today's students may be underprepared for both graduate and undergraduate coursework, yet they seek to become professionals in their fields. Frustration on the part of all who teach in higher education has led to the question, "How do we teach today's students such that they master the content?" The answers to this question come from three areas: looking at traditional course design, backward by design, and transparent teaching. Additionally, the steps of lesson design and engagement techniques are important. Traditionally, professors planned a course by choosing a classic text, planning lectures, and hoping for the best. Traditional teaching can work, when the lessons are planned with visuals, informal assessments, and explicit teaching. Backward by design, also called understanding by design (Grant Wiggins and Jay McTighe's work), implies that an instructor look at the biggest, most important outcomes of a course, and then plan ways to get students to achieve those outcomes. Transparent teaching, as defined by Mary-Ann Winklemes, includes task, purpose, and criteria. Explicit explanations, crystal-clear aligned assessments, and a rationale of what is taught can improve student achievement. When much content must be mastered by students in order for them to progress to graduate school, or to begin their professional lives, explicit direct instruction can be powerful. Well-crafted, well-taught lessons achieve that end. Strategies for a single lesson include a focus, presentation of material, application/practice of material, and review/assessment. The knowledge base of learning continues to expand rapidly, and research-based methods of teaching do exist. The work of Brown, Roediger, and McDaniel has challenged traditional thought on how students learn, and influenced how professors can teach such that today's students can learn. All of these strategies can be used at all levels of teaching in animal science, to prepare the next generation of professionals in the field.

Key Words: college students, learning theory, teaching strategy

1763 Beyond veterinary school: Helping animal science students explore other career opportunities.

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A large percentage of students entering undergraduate animal science programs have a desire to become a veterinarian. For example, at Berry College, a private school in northwest Georgia with an animal science program, $81 \pm 0.6\%$ of the incoming freshmen ($n = 194$) for the last 2 yr have indicated a desire to become a veterinarian. Animal science is an appropriate undergraduate major for students interested in veterinary science, and animal science programs should help those students to successfully obtain those goals, however many students come from a background with little experience or knowledge of opportunities for a career working with animals other than veterinary medicine. At Berry College, $69 \pm 1.5\%$ of the incoming freshmen for the last 2 yr reported coming from an urban or suburban area, and only $14 \pm 1.9\%$ reported living on a farm. While more freshmen report being from a farm at Iowa State University (29.15% in 2014 and 42% in 2015), the trend is still similar. These urban and non-farm students have a desire to work with animals, but limited knowledge of the opportunities available as indicated by the fact that $25 \pm 2.9\%$ of the incoming freshmen at Berry College indicated having no experience working with their primary animal of interest. To help students further define where their passion may lie, steps have been implemented in the Department of Animal Science at Iowa State University to inform incoming and freshmen students about the diversity of careers in animal science. During campus visits with high school students and families, the vast array of opportunities surrounding careers in Animal Science are discussed briefly. More discussion follows during Freshmen Orientation, and also during ANS 110: Orientation in Animal Science. Freshmen and transfer students enrolled in ANS 110 were asked to indicate their interest in various careers at the beginning and again at the end of the semester. At the beginning of the semester, 62% (315 responding) indicated that veterinary school was their primary interest. The last week of class, only 43% (296 responding) responded that this was still at the top of their interests. Even more interesting was the increased interest in graduate school (8% in September vs. 17% in November). Identifying interests earlier in their collegiate career will allow students to take advantage of internships and other experiences more closely related to their interest.

Key Words: prevet, teaching, undergraduate