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Department(s): Biology

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Title of Presentation: What is too much and too little?

According to a recent study, 66% of American adults are either obese or overweight and this figure is expected to rise in the coming years. Additionally, rates of obesity in the adolescent population are also increasing at an alarming pace. Because of the obesity epidemic, comorbidities such as Type II diabetes mellitus, hypertension, and sleep apnea are also on the rise, increasing healthcare costs. After reviewing the epidemiological literature relating to obesity and anorexia, an eating disorder characterized by low feed consumption, we evaluated the role that hormones play in regulating appetite and eating pathologies. We have compiled information regarding hormones that regulate appetite and metabolism and attempted to understand how they act in concert under homeostatic conditions. We then used this knowledge and primary literature focusing on the dysregulation of endocrine factors in eating disorders and obesity to elucidate the hormonal mechanisms by which they could be controlled. We found that multiple hormonal pathways control appetite and metabolism and that a slight perturbation in one of these pathways could manifest itself in the symptoms associated with obesity or anorexia. Further research is needed to fully elucidate the role that hormones play in appetite control and eating disorders.

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Department(s): Animal Science, Poultry Science, Zoology

Teaching Mentor(s): Vivek Fellner/Animal Science

Title of Presentation: US Food Systems: America's Mood for Food

Traditional farming is fading as goods are distributed through the growth of major markets. The past few decades have witnessed an increase in large conventional farms due to the need for a larger food supply for the growing world population. Organic farming has become popular as an alternative to reduce the amount of synthetic products used to treat both plants and animals. Organic farms want to return the soil to its original living state unlike conventional farms. In addition to the change in farming systems there have been differing opinions involved with optional animals used for food. While many see the benefits of using alternative livestock for food production, public opinion continues to influence farmers' production lines. As consumers become more knowledgeable they seem to prefer buying from local markets although many continue to shop at supermarkets. Irrespective of where Americans shop, products sold in these markets are tailored to reflect their source and nutritional attributes. Consumers want leaner products from animals exposed to humane and ethical treatment. Creating a universally accepted system for defining an organization's carbon footprint is imperative for the future of our food supply system. A three-tiered system has been proposed, in which organizations can choose how inclusive their carbon footprint actually is. Livestock contributes a considerable amount of gas emissions, uses much of our freshwater supply, and is a large factor in the loss of biodiversity on our planet. In order to reduce the livestock industry's negative impact on our environment steps need to be taken to counteract its effect. Perhaps consumers need to be more open about including unconventional food sources and be more aware of consequences of a reduction in the amount of livestock eaten, if we are to make the planet "green" again.

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- Department(s):** Biochemistry, Biological Sciences, Chemistry, Nutrition Sciences, Zoology
- Teaching Mentor(s):** Michael B. Goshe/Molecular and Structural Biochemistry
- Title of Presentation:** Win If You Can, Lose If You Must, But Always Cheat: The Use of Performance-Enhancing Drugs in Sports

Performance-enhancing drugs are commonly used throughout the modern world, including their illegal use in sports in an attempt to gain a competitive edge. Stimulants, peptide hormones and anabolic steroids are three general classes that describe most doping agents according to their biochemistry. Stimulants are organic compounds that are used to excite the central nervous system and to alter metabolic activity. Amphetamines are stimulants that prolong their tolerance to anaerobic metabolism, increase motor activity due to adrenaline release, and inhibit dopamine reuptake. Peptide hormones are comprised of amino acids and work by interacting with an extracellular receptor to affect cellular processes via second messengers. The overall mechanism of peptide hormones is to ultimately affect specific enzymes already present in sufficient concentrations within the cell to alter biochemical function. Erythropoietin (EPO) is a physiologically naturally occurring hormone in the body and is responsible for erythrocyte, or red blood cell, differentiation, survival and proliferation. The effects of EPO activity can be increased by taking erythropoiesis-stimulating agents (ESA) to produce an unnatural increase in erythrocytes and thereby promote more efficient oxygen delivery to the tissues. Anabolic steroids are lipid-based hormones that function by interacting with intracellular receptors to stimulate anabolic, or building, processes within the cell. Tetrahydrogestrone (THG) is an anabolic steroid that causes increased differentiation of multipotent mesenchymal cells and promoting muscle growth. Our presentation will present material regarding the synthesis, route of administration, pharmacokinetics and pharmacodynamics, and methods of analysis for several performance-enhancing drugs of each class and will discuss their role as doping agents in modern sports.

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Department(s): Animal Science, Biology, Microbiology, Zoology

Teaching Mentor(s): Gerry Luginbuhl/Microbiology

Title of Presentation: Understanding the Plague: A Deadly Zoonosis

Over the course of 2000 years, three pandemics swept across the known world, all due to one bacteria: *Yersinia pestis*. In one pandemic, it was estimated that about 10,000 people died daily. *Yersinia pestis* is still of concern today, considering there are natural foci of infected reservoirs on every continent except Australia. The Bubonic plague, a deadly zoonotic disease, can be hosted in over 200 species and 73 genera of mammals. It's transferred from these animals to humans via the flea. The bacteria grow in the flea's proventriculus, blocking the digestive tract. This causes the flea to enter into a feeding frenzy, increasing the likelihood that it will bite a human or reservoir host and transfer the pathogen. In the human, *Yersinia pestis* has a one to seven day incubation period before symptoms appear; such as, fever, chills, weakness, and most notably swollen lymph nodes which evolve to form infected bubos. Genetic and molecular studies have led to a better understanding of the structure and virulence of the bacteria. Once *Yersinia pestis* enters the human body, it activates its own genes which initiate the production of virulence specific proteins called YOPs. The bacteria form a structure enabling these proteins to enter into macrophages and inhibit their function. Currently, antibiotics and a vaccine are available for treatment and rapid diagnostic tests are being developed. *Yersinia pestis* is still on the minds of many, due to its potential bioterrorism threat.

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Teaching Mentor(s): Gerry Luginbuhl/CALS Academic Programs

Title of Presentation: Deadly Hemorrhagic Fever: An Investigation of the Ebola Virus

The first major outbreak of Ebola occurred in 1976 in Zaire. Six additional major outbreaks have occurred in Africa; the most recent occurred in January 2008 in Uganda. There are at least five distinct strains of Ebola with symptoms ranging from mild headaches to severely painful, hemorrhagic fever. Ebola has a high human fatality rate of 20 to 90%. While there is still much unknown about this virus, research continues to progress. The exact reservoir is unknown, but significant evidence points to megabats. The Ebola virus belongs to the Filoviridae family (filovirus) and is a close relative to the Marburg virus. It is a filamentous enveloped single stranded RNA virus. The entire genome has been sequenced for at least three strains including Reston, Sudan, and Zaire. Of the known strains, Reston is unique in its inability to cause disease in humans. Genomic data is playing a key role in identifying virulence characteristics of the viral strains. Transmission is known to occur via direct contact with infected hosts; however, Reston is believed to be transmitted through the air. With little known treatment for Ebola in humans exists, there have been advances in the effective treatment in non-human primates. Supportive therapy is the only way to manage symptoms in humans, while vaccines and other anti-viral treatments are being developed. Media has sensationalized and heightened peoples fear and awareness of the virus, perpetuating rumors and myths about the disease. An investigation into how local people respond and manage the virus outbreaks may help researchers to contain and prevent epidemics.

Student Author(s): Pooja J Apte and Karen A Payne

Department(s): Biological Sciences

Teaching Mentor(s): James A Knopp/Biochemistry

Title of Presentation: Analyzing Initial Preparedness of Students Entering BCH 451 Based on Organic Chemistry II Professors

Over the past decade, a diagnostic quiz has been administered to students at the beginning of Biochemistry 451 to gauge their readiness for this class. Specifically, the questions on this quiz test knowledge in biology and organic chemistry, the two main prerequisite courses for BCH 451. Because organic chemistry is a critical preparatory course, we wanted to explore in more detail the effect of the preparation given from the different instructors at this University. The purpose of this project is to test the null hypothesis that there is no difference in the performance of students in the diagnostic quiz based on previous Organic II professors. Data was collected from these quizzes during both of fall 2008 and spring 2009 semesters during the first week of classes. To look at this correlation we grouped the organic questions on the quiz into four categories: structures, pH/pKa, addition reactions, and oxidation/reduction reactions. Responses were normalized based on the number of students taught by a particular faculty member and compared to that Organic II professor. In general, the average correct response rate was small, and most of the individual categories did not show any statistical difference between the Organic II professors. Through this project we hope to stimulate improvements in the background of students so that they can become successful in Biochemistry 451.

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Teaching Mentor(s): Gerry H. Luginbuhl/CALS Academic Programs
Barbara M. Kirby/CALS Academic Programs

Title of Presentation: Global Seminar: An Inside Look

The Global Seminar class used case studies as a tool to explore the technical, societal, ethical and economic challenges of practicing sustainable agriculture. One of the case studies was based in India, on the topic of Golden Rice and its relationship to Vitamin A deficiency. The class used background research, guest speakers and group discussions to prepare for an international videoconference. We will present an overview of the case study, the presentation our team developed on the benefits of golden rice and the results of the video conference with university students in Taiwan, Sweden and Austria. Some of the challenges of this case study included technological difficulties, cultural differences and varying global opinions and preconceived notions regarding why a country or company would take action on a humanitarian issue. India has some of the highest rates of Vitamin A deficiency in the world, which leads to numerous health related diseases and disorders within this country. There is a genetically modified rice variety termed golden rice that has been engineered by Syngenta, a U.S. based company, to express beta-carotene, which the body can then metabolize into Vitamin A. The argument for golden rice is that it is more effective than current vitamin A supplementation programs, but there are concerns relating primarily to cultural acceptability and safety issues of genetically modified organisms. With the implementation of educational programs and further research, golden rice could become a viable solution to Vitamin A deficiencies in such countries.

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Department(s): Biochemistry, Biological Sciences, Food, Bioprocessing, and Nutrition Sciences

Teaching Mentor(s): Suzie Goodell/Food, Bioprocessing, and Nutrition Sciences

Title of Presentation: The factors influencing parental modeling of eating behaviors

Introduction: The rate of childhood obesity has tripled since 1970. Parents play a pivotal role in shaping children's eating habits through the purchase and availability of foods, preparing and serving healthy foods, establishing meal-time environment, and modeling healthy eating behaviors. This research examined the factors that influence parent modeling, one important aspect associated with the parental role in child eating.

Methods: A literature search of articles published since 2000 using keywords "model" AND ("meal" OR "snack" OR "food") AND "child" AND "parent" was conducted through PubMed. This search produced 166 articles, which were then sorted based on relevance to the Information-Motivation-Behavior Skills behavior change model.

Results: Accurate information about nutrition, healthy eating behaviors, and their role as models for healthy eating influence parent modeling. Motivational factors influencing parent modeling include: social economic status, community support, and parental perception of health. Behavioral skills that play a key role in parent modeling are the parent's degree of involvement and time spent with their children, as well as the availability of fruits, vegetables, and other healthy foods.

Discussion/Conclusion: Parent modeling is key to a healthy child because the child is dependent on the parent to determine their perspective on healthy eating. Based on the results of the literature review, an intervention focusing on parent education regarding health and nutrition would likely increase positive parent modeling behaviors. Researchers need to conduct focus groups to find other factors influencing parent modeling behaviors. Based on these results researchers should investigate the relationship between parental modeling and childhood obesity.

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Department(s): Biological Sciences

Teaching Mentor(s): Jane L. Lubischer/Biological Sciences

Title of Presentation: Development of a Neurobiology Inquiry-Based Learning Module

Research has shown that active learning is more effective than learning in traditional lectures. Students tend to remember the material better when they actively engage with the material. Active learning takes many forms, including inquiry- or problem-based learning. Our goal was to develop an inquiry-based approach to teaching basic neurobiology concepts. Our primary teaching goal was to help students understand what an action potential is and how it works. We focused on seizures in epileptic cases to understand the basic organization of the brain and then used a series of problems to guide students to an understanding of the ionic basis of the action potential. Through various teaching methods, including graphs, diagrams, questions, and exercises, we designed a lesson plan to teach membrane potential, action potentials, neurotransmitters, and brain organization. Students will be able to describe how ionic movement creates action potentials.

Student Author(s): Angela Delis, Angela Stancil, and Tiffany Wong

Department(s): Biological Sciences

Teaching Mentor(s): Miriam Ferzli/Biological Sciences

Title of Presentation: Interactive Case Studies in Introductory Level Biology: Helping Students Learn Concepts

The use of supplemental computer-based materials may enhance student performance as well as enjoyment in a course. In our study, we developed and tested the use of interactive case studies that may be used in both traditional and distance education biology classroom formats. We focused on topics covered in introductory biology (Bio 181 and 183) and compared traditional hardcopy case study presentation with the online interactive approach. Since distance learning students are less likely to discuss course material with other students, it is important for them to think critically and interact with the concepts on their own. The interactive case studies were composed using Quandary software, a program for adding interactive components to traditional case studies. Students were assigned either a traditional hardcopy case study or an interactive one on a specific topic. Students were assessed based on their responses to the case study questions. All responses were collected using online tools. Two groups of students compared the two formats for select topics and completed a survey which asked them to consider the usefulness of each. Based on the survey results, 93% of students preferred the interactive format to the traditional hard copy version. Students cited that the interactive versions gave them immediate feedback on their answer choices and were more user-friendly. In general, case studies helped students relate course material to real life situations, furthering their interest in topics covered in class.

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Teaching Mentor(s): Suzie Goodell/Food, Bioprocessing, and Nutrition Sciences

Title of Presentation: Increasing Nutrition Knowledge in Parents of Three-to-Five Year Old Children

The WALNUTS program is a student-driven community outreach program aimed at increasing nutrition knowledge in parents of Head Start preschoolers in North Carolina. In the current research, WALNUTS partnered with eight Head Start schools in Wake, Orange, and Durham counties to improve parents' knowledge about sweetened beverages, osteoporosis and calcium-rich foods. The eight sites serve a total of 751 families, all of which have access to the WALNUTS education. NCSU students developed and implemented six lesson plans on osteoporosis prevention and six on childhood obesity prevention. Each lesson included a display board with educational content in English and Spanish, handouts in English and Spanish, a pre-post quiz for parents, and a training video for student educators. Each weekly session consisted of a 3-5 minute presentation in the Head Start lobby, including a game or activity. A lesson's effectiveness was evaluated by a three-question pre- and post-lesson quiz. Results from four of twelve lessons are presented. A total of 39 parents completed quizzes. The pre-lesson average scores ranged from 2.2 to 2.8; all post-lesson averages were 3, the maximum. This data is part of a pilot project with a low sample size, thus no statistical significance can be inferred. The pre-lesson results indicate that parents have some basic knowledge of childhood obesity and osteoporosis prevention; however parent knowledge increased after receiving the education. This indicates that Head Start parents are acquiring more knowledge of sweetened beverages, calcium-rich foods and osteoporosis prevention through the WALNUTS nutrition education program. NCSU students are investigating ways to improve parent involvement in future education projects using different modes of education, for example: employing small parent sessions scheduled weekly with separate educational activities for children.

Student Author(s): Brittany N. Hoyle, Margaret J. Freeman, and Melissa K. Wood

Department(s): Biological Sciences

Teaching Mentor(s): Miriam G. Ferzli/Biology

Title of Presentation: Visual Aids and On-line Resources as Supplemental Learning Aids in Introductory Biology Courses

Research has shown that laboratories are essential for understanding Biological processes taught in Introductory Biology I courses. However, research also suggests that laboratories often do not assist students in fully understanding the subject material or creating a connection between laboratory work and classroom teachings. Therefore, it is important that additional resources be provided to accompany laboratory work. Educational technologies are often used in conjunction with instructional strategies to deliver content and facilitate conceptual understanding. Our project contained two phases. The first phase involved the determination of what students desire most in a supplemental laboratory website and development of the website. The second phase determined the effectiveness of the website as a supplemental learning aid with a focus on the visual aids that are part of the website. Student data was collected through survey responses. Findings show that the majority of students found that the supplemental lab website allowed them to learn concepts from the entire lecture including the laboratory course. Student responses indicate that the visual aids incorporated into the Biology Laboratory Website helped their short-term and long-term understanding of the material taught in lab. Students also agreed that supplemental learning aids, such as the Biology Laboratory Website, are an advantage when completing work outside of the classroom, especially since their contact time with an experiment or lab activity is restricted to their assigned weekly lab session. Based on the overall findings, the Biology Laboratory Website seems to be a successful supplemental learning tool in assisting students with understanding difficult concepts as well as in improving the overall learning experience.

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findings, the Biology Laboratory website seems to be a successful supplemental learning tool in assisting students with understanding difficult concepts as well as in improving the overall learning experience.

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Department(s): Applied Sociology, Biochemistry, Biological Science, Microbiology, Zoology

Teaching Mentor(s): William A. Hoffmann/Plant Biology

Title of Presentation: A Framework for Teaching the Proximate and Ultimate Factors that Shape the Evolution of Complex Societies

Modern societies, whether industrial powers such as the United States or aboriginal tribes such as those found in the Amazon, have endured many historical influences upon their survival. While the history of modern societies have origins thousands of years old, it is interesting to note that ultimately, each modern society evolved based on the same determining factors. Upon reading Jared Diamond's book, "Guns, Germs, and Steel," a set of proximate and ultimate factors arise that seemingly each society passes through in order to continue to exist today. The key factors, in this particular order, orientation of the characteristics of native species, geographic factors that the ease of spread of agriculture, ability to produce and store food surpluses, the emergence of large, dense, sedentary, stratified societies, written language and eventually technology. It is important to note that each modern society has not passed through each factor; those we refer to as industrious societies have, whereas third-world societies can be found at any given point. Our objective was to develop an approach for teaching these factors that determine why have certain societies acquired characteristics and technologies considered modern whereas have not. Our approach is to visually represent each determining factor as a branch point in the chronological time line. Each branch point leads to a separate path in history. Some societies perished, while others flourished. Some societies have maintained isolation for hundreds of years, while others eventually converged into a larger society.

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Department(s): Biological Sciences, Plant Biology

Teaching Mentor(s): Chad Jordan/ Plant Biology

Title of Presentation: Strategies for Increasing Calcium and Iron Availability in Crop Plants

Calcium and iron deficiencies are two of the world's most prominent nutritional disorders affecting populations in both underdeveloped and developed regions. Calcium deficiency can result in osteoporosis and inhibit proper growth and development, whereas iron deficiency results in iron-deficient anemia and numerous other disorders. There are a limited number of food sources that supply adequate levels of calcium and iron, especially in underdeveloped regions where needs are the greatest. This has led to multiple research efforts to improve the bioavailability of nutrients in major world food crops. Breeding strategies have been employed, but with limited success. A more promising and direct strategy to increase calcium and iron bioavailability in plants is genetic engineering. Two main strategies have been employed to increase calcium levels: increasing calreticulin, the major calcium binding protein in the endoplasmic reticulum, and increasing the tonoplast cation exchanger (CAX) in the vacuole. There are also several methods currently being used to increase bioavailable iron. Overexpressing the ferretin protein, a major iron storage protein in plants, has been shown to result in higher available iron concentrations. Transgenic approaches to increase phytase degradation of phytic acid, an iron antinutrient, have also been used to elevate iron absorption efficiency. While investigating the effectiveness of these transgenic methods, we also uncovered some potential drawbacks. Targeted manipulation of gene expression may result in undesirable plant metabolic and physiological changes as well as abnormal growth phenotypes. Food preparation can also diminish the amount of calcium and iron in the plant that is readily available for absorption. Foods produced using transgenic methods are currently in various stages of testing and implementation. So far, these methods show a promising means of supplying the world with crop plants biofortified with calcium and iron.

Student Author(s): Bonnie F. Merrell and Mary M. Wilson

Department(s): Biochemistry, Biology

Teaching Mentor(s): Dr. Robert Beckmann/Plant Biology

Title of Presentation: Investigation of Student Satisfaction in BIO 105: Biology in the Modern World

The purpose of this project was to investigate the situation of the introductory biology course, BIO 105. NC State University's course catalogue describes the course as "Biology in the Modern World - Principles and concepts of biology including cellular structure and function, metabolism and energy transformation, homeostasis, reproduction, heredity, diversity of life, ecology, evolution and animal behavior. Emphasis on human affairs and human examples. For non-science students." It is paired with the laboratory course BIO 106. The course is primarily geared towards students who are not in the sciences or have yet to declare a major. As such, we speculated that for a lot of students in the class, this would be their only exposure to biology while at NC State. As students in the College of Agriculture and Life Sciences who are proud of our college, we find it extremely important that this exposure to science be a positive one. In order to gauge the demographics of the class and students' level of satisfaction, a survey was created and administered to Robert Beckmann's BIO 105 class of Spring 2009. It was found that all colleges were represented in the class, with varying degrees of satisfaction. Students in the College of Physical and Mathematical Sciences seemed to find the material most relevant while students in the College of Design found the course material least relevant. There are certain elements of the course and lab that students find interesting and relevant, but there are other elements that could be modified in order to relate more to the students. More work should be done in order to investigate how best to modify the class to suit the needs of a diverse population of students.

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Department(s): Microbiology

Teaching Mentor(s): Jonathan Olson/Microbiology

Title of Presentation: Biofuels

With the growing concern of the effect of fossil fuels on the global community, there has been a surge in the interest of alternative fuels. Although many recognize corn-based ethanol as the leader in this field, other exciting alternative fuels are also being developed by the scientific community. Work is being done to examine the pros and cons of, not just corn-based ethanol, but also cellulosic ethanol and ag-waste ethanol. One cannot just examine the world of ethanol, however, as there is a new and growing range of alternative fuels being developed, including hydrogen power, biobutanol, biodiesel, biogas, and third generation biofuels. With these new technologies being developed and made efficient, it is important to develop and examine the pros and cons of each, for only then can a truly educated decision be made.

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Teaching Mentor(s): Gerry H. Luginbuhl/CALS Academic Programs
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Title of Presentation: Think Globally, Act Globally

With the expansion of technology and the subsequent diminishing barriers to communication, the world has become effectively smaller. As we develop a global identity and unified sense of responsibility, a new diplomatic approach, based on international cooperation, has arisen to tackle the world's problems. Issues of water and food accessibility, population expansion, and climate change, as well as development of sustainable practices and solutions, must be explored with regard to preserving biodiversity, considering cultural context, and promoting environmental stewardship. By developing courses with universities from around the world, students stand to gain not only an international view of the material itself, but also insight into the backgrounds of their international peers. The case-study approach to instruction further facilitates collaboration between the international groups and allows students to develop broader social/cultural, political, economic, technical, health, environmental, and ethical/philosophical perspectives of the studied topics. Technology including video conferencing and online discussion boards allow students to participate in a global classroom experience.

Student Author(s): Caroline H. Bateman

Department(s): Biology

Teaching Mentor(s): James A. Knopp/Biochemistry

Title of Presentation: Gender Differences in Performance in Principles of Biochemistry based on Bloom's Taxonomy of Question Difficulty

This research project is a continuation of a previously reported study whose goal was to examine statistical differences between genders in exam performance for the Principles of Biochemistry course, BCH 451, at North Carolina State University. The course is designed for biochemistry majors and honors students, and is under the direction of Dr. James Knopp. The null hypothesis was that there is no statistical difference in exam performance when compared with gender. The Spring 2008 majors and honors section consisted of approximately 70 female and 40 male students, the Fall 2008 majors and honors section consisted of approximately 70 females and 60 males, and the Spring 2009 majors and honors section consisted of approximately 70 females and 50 males. As far as practical, the course material and nature of exams were equivalent for all three semesters. The questions on the exams were individually classified as knowledge specifics, knowledge universals and abstracts, comprehension, application, analysis or synthesis using Bloom's taxonomy. Each student's gender and performance on each question was recorded for the first three exams given. The data collected was then normalized. The mean, standard deviation, and standard error were calculated for each of the question types on each exam. These calculations allowed the data to be analyzed for statistical difference at the $p < 0.05$ significance level. The Spring 2008 data showed significant difference for the knowledge-specifics, analysis, and synthesis question types. The Fall 2008 data showed significant difference for the knowledge-specifics question type. The Spring 2009 data showed significant difference for the application, analysis and synthesis question types. For the Spring 2009 semester, females performed better on application questions in exam one and on synthesis questions in exam three. In contrast, males performed better on analysis questions and synthesis questions in exam one.

Student Author(s): Jamie B. Boyd

Department(s): Biological Sciences

Teaching Mentor(s): Chad V. Jordan/Plant Biology

Title of Presentation: Student Satisfaction and Performance in a Plant Life Laboratory Based on Time of Day and Day of Week

Plant Life (PB 200) is a large introductory science course requiring that nine lab sections be taught across the span of the week. PB 200L is offered on three days (Tuesday, Wednesday, and Thursday) and at three different time periods (morning, afternoon, and evening). This project assessed whether the day of week and time of day that students were enrolled in the lab significantly impacted their satisfaction with the lab and overall course, and also determined if their satisfaction correlated with their performance in lab. A survey was developed and administered to students (n=207) in lab during the ninth week of the 2008 fall semester. The survey asked students to rate their overall satisfaction of the lab and satisfaction of the time of day and day of week they were enrolled. Student lab quiz scores were also collected over the entire semester for correlation analysis. A comparison of student satisfaction ratings across day of week revealed that student satisfaction with Tuesday labs was significant compared to Thursday labs ($p < 0.05$). However, student satisfaction with Wednesday labs was significant compared to both Tuesday and Thursday labs ($p < 0.05$). Student satisfaction with morning labs compared to the afternoon labs and the afternoon labs compared to the evening labs were also significant ($p < 0.05$). Student performance and their overall satisfaction of the lab, was rated lower on Thursday compared to both Tuesday and Wednesday labs, however it was not significant ($p < 0.05$). Taken together, these results indicate that not only do students prefer to take labs in the afternoon on Wednesdays, but also that students perform better academically earlier in the week. As a result of this study, this type of data will be collected in future semesters to determine if these trends are consistent.

Student Author(s): Natalie K. Cooke

Department(s): Biochemistry, Nutrition Sciences

Teaching Mentor(s): Bob P. Patterson/Crop Science

Title of Presentation: Reflection and Discussion-Based Learning in World Population and Food Prospects

World Population and Food Prospects is a Freshman Inquiry course that is relevant to major problems facing the world. It is especially important as it increases students' awareness of global issues including hunger, poverty, and global sustainability. This teaching project facilitates students taking an active role in reflecting on their views of the world through weekly written reflections based on readings in the book "Hungry Planet" by Peter Menzel and Faith D'Aluisio. Students were introduced to relevant topics by guest speakers and lectures. At the end of the semester, students were organized into groups and asked to apply their knowledge by writing a grant proposal based on a country from "Hungry Planet" or the Ready-to-Use food, Plumpy-nut. Plumpy-nut is a peanut butter paste containing essential vitamins and minerals that has successfully been used in nutritional rehabilitation programs. All of the groups decided to make Plumpy-nut the focus of their grant proposals. Students demonstrated their knowledge of program development and thoughtful consideration of local sustainability of resources. Students felt that "Hungry Planet" aided in their changed viewpoints by giving personal stories to which they could relate, and students reported that they were very interested in discovering the differences in food availability around the world. The class discussions gave students the opportunity to hear other students' viewpoints. In fact, many students expressed that in the future, more time should be allotted for class discussions as they learned a significant amount from their peers. Overall, the students who demonstrated significant engagement in the course through detailed weekly reflections and prominent roles in class discussions tended to have higher scores on exams.

Student Author(s): Allisyn L. Kennedy

Department(s): Biological Sciences

Teaching Mentor(s): Betty Gardner/Genetics

Title of Presentation: Enhancing Distance Education Learning Through Message Board Communication and Extra Practice Problem Sets in GN301

Genetics in Human Affairs, or GN301, is a course taught in the fall and spring semesters at North Carolina State University. The purpose of the course is to allow students to have a greater understanding of the different principles of genetics in relation to human development, diversity, diseases, and disorders. Serving as the teaching assistant for the Distance Education section of GN301, the focus of my teaching project was to help enhance the experience for students taking GN 301 through distance education. To strengthen learning through distance education I added interactive communication between classmates through the Message Board at the course's webpage hosted through WebAssign. Adding communication through the Message Board allowed the online class to have more of an in-class feel and mimic what a discussion in an on-campus section of the class would be like. Concepts discussed through the Message Board focused around different controversial issues in current human affairs in genetics. Along with stimulating classroom-like discussions, I also created several problem sets for difficult material that was covered throughout the course. Problem sets covered the concepts of the Central Dogma of DNA, Pedigrees, Hardy-Weinberg Equilibrium, ABO Blood Typing, and Variable Number of Tandem Repeats. A mid-semester survey was conducted during the fall and spring which asked students if supplemental practice was helpful and aided in the experience of the course. From the results of these surveys I concluded that the students found the supplemental practice to be a helpful part in understanding the concepts of the course. As a result of my conclusion, I would recommend communication through the Message Board and extra practice problem sets to be used in future Distance Education sections of Genetics in Human Affairs.

Student Author(s): Kaitlyn A. Kennedy

Department(s): Biological Sciences

Teaching Mentor(s): Betty Gardner/Genetics

Title of Presentation: Implenting the Use of Brochures Generated From GN 301H Regarding Current Hot Topics In Genetics in Human Affairs Into the Classroom For Further Enrichment

Genetics in Human Affairs, GN 301, gives interested students the opportunity to understand genetics and how it is applied to daily life. Taken for honors credit, GN 301H is a supplemental component to the lecture in which students complete a small group research project dealing with genetics and its application to human affairs. It has been my responsibility to work closely with Dr. Gardner and students from GN 301 by taking on the role as head teaching assistant for GN 301H. My role included organizing presentation groups based on topics brainstormed by students at the beginning of each semester. I then placed each student into a group based on their personal preference and served as a resource to students by being available for group meetings, planning and to answer questions. GN 301H met eleven times over the course of two semesters where students gave PowerPoint presentations followed by a question and answer session on the presentation. Students filled out a review sheet after each presentation to give presenters feedback. Students found these reviews to be helpful when planning their presentations. Students also created brochures that were made available to all students enrolled in GN 301. The brochures were placed on the bulletin board inside room 2712 in Bostian Hall along with questions on the information from the brochures. Extra credit questions were then created for tests based off of the information presented on the bulletin board. The objective of the questions was to make students think critically about current topics in genetics. Overall, feedback to the honors component and the resources generated from the honors component was positive and students were receptive to the materials presented. Based on test scores, students performed well on the questions asked on tests and were exposed to more thought provoking topics in genetics.

Student Author(s): Katrina B. Levine

Department(s): Biology

Teaching Mentor(s): Lisa D. Parks/Biology

Title of Presentation: Evaluation and Modification of Advanced Physiology Courses at NC State

The biology department at NC State University is making changes to its curriculum to meet the demand for new concentrations and more advanced courses. Current courses, such as ZO 421: Principles of Physiology, will focus more on the development of critical thinking and analytical skills. In addition, the department is adding a higher-level physiology lab, BIO 426: Advanced Human Anatomy and Physiology Lab, which is an important component of new concentrations and allied health career paths (which often require two semesters of physiology lab). A distance education version of ZO 421 is also being proposed. The goals of this teaching project were to collect online resources to use in the lecture and lab and to help evaluate possible lab activities. I contributed to the planning process by gathering a list of web-based resources to be used in the on campus and distance education advanced physiology courses and by assessing the new syllabus for BIO 426. I also helped develop and test potential activities for the 400 level students, making sure that the equipment used is appropriate and the activities are of suitable difficulty. The lab, which will include the online resources and the lab activities, will be implemented in the fall of 2009 and will consist of 4 sections with 24 students each. The online resources will be employed in the lecture beginning in fall 2009 and future sections of the distance education course.

Student Author(s): Scott J. Matthews

Department(s): Biological Sciences

Teaching Mentor(s): Sarah Ash/Nutrition

Title of Presentation: A Website with a Pictorial Guide to Help with Estimating Dietary Intake

For my ALS 499H project did a teaching project that relates to nutrition. I was a teaching assistant for Dr. Sarah Ash in NTR 301, Introduction to Human Nutrition. For my project I chose to expand on one that a student had done the semester before. In NTR 301 the main out of class assignemnt is called a food diary, where students record their food and beverage intake for five to seven days and then they put their results into a computer for a dietary analysis. The main problem is that most students do not know how to correctly estimate their food intake and many have a problem, in particular, of underestimating what they actually consume in their diets. The previous student had composed a booklet that showed pictures of different commonly consumed foods with different serving sizes for each of them. The students in the class then used this book in the computer lab to help them with estimating their dietary intake. Dr. Ash wanted me to take it a step further by putting in more foods by making a website where the pictures could be posted for the students to look at either before coming to the lab or while in the lab. After using the website for their assignment, the students filled out a survey on its effectiveness. Findings included that, of the 325 people that took the survey, 210 of them (65%) had used the website. Of the 210 students who used the website, 95% of them deemed it to be helpful, scoring it at a 3 or better; on a scale of 1 to 5, 5 being very helpful. Overall, the project was successful in meeting the instructor's goals.

Student Author(s): Brandon P. Maynard

Department(s): Biology

Teaching Mentor(s): Marta Jean Klesath/Biology

Title of Presentation: Oral Anatomy; Endodontic Treatments by studying anatomy, procedure and case studies.

In BIO 302 we cover the anatomy and physiology of Homo sapiens. Topics include Cell Biology/Body Tissues, Integumentary System, Skeletal System, Muscular System, Nervous System, Endocrine System, Cardiovascular System, Lymphatic System, Respiratory System, Digestive System, and the Urinary System. My area of interest is the oral cavity portion of the digestive system.

 For my ALS 499H Project I decided to implement my experiences and external knowledge of the oral cavity to help teach anatomy and physiology by using a case study from my dental assisting job. With this case study I presented the lab with common readings of a dental x-ray, the procedure and tools of endodontic treatments, and clinical identification of adult teeth. I found it useful to present this knowledge with videos, power points, models, x-rays, and tools found at a dental office. The effectiveness of my presentation was measured by student/teacher feedback and lab quiz grades taken one week after the material was presented.

 Videos, models and case studies are exceptionally useful in teaching oral anatomy. Case studies are a way for the students to be put into real-life scenarios and make knowledge learned in class practical. Models and videos are useful in explaining complex procedures and depicting anatomical features of the oral cavity.

Student Author(s): Christopher S. McDaniel

Department(s): Biological Sciences

Teaching Mentor(s): Chad V. Jordan/Plant Biology

Title of Presentation: An online learning resource for plant anatomy and morphology

Students that take introductory plant life courses, including Plant Life (PB 200), traditionally learn plant anatomy through classroom lectures and in lab using slides and textbook diagrams. To augment the existing anatomy content of the course, an online plant anatomy resource (PAR) was developed and implemented in PB 200 in the fall 2008. Over 100 images of fresh and pre-prepared plant material were captured and assembled into four units on plant primary growth, roots, stems, and leaf anatomy and morphology with an emphasis on monocot and dicot comparisons. The resource also included quizzes that allowed students to self-test their knowledge and gain confidence in their ability to master the content. The resource was made accessible to all students via the WebCT course site. A survey administered at the conclusion of the semester revealed that approximately 47% of enrolled students used the resource at least once during the semester. To determine the efficacy of the PAR as a learning tool and its impact on student learning, exam grades of students who used the resource were compared to those who did not. Students who used the resource scored higher on an exam that had greater than 60% anatomy content ($p < 0.01$). The survey also asked students to provide feedback on how the PAR could be enhanced as an effective learning tool. Taken together, the findings from this study suggest that the PAR is effective in helping students to learn challenging anatomical material. The PAR will be expanded to include other anatomy content for future use in PB 200, as well as content appropriate to establish a comprehensive resource for other Plant Biology undergraduate courses.

Student Author(s): Sarah E. Mitchell

Department(s): Biological Sciences

Teaching Mentor(s): Miriam Ferzli/Biology

Title of Presentation: The Effectiveness of Assessments for Distance Education Students in Introductory Biology

Distance Education (DE) courses are important because they provide an alternative method for non-traditional students, such as adults with families or strict working hours, to take classes and obtain an undergraduate or graduate degree. In recent years, distance education has become popular for traditional students as well, since students are increasingly busier with work schedules, internships, and other academic involvement. In this teaching project, I used *Hot Potatoes®*, a freeware program for making interactive quizzes, to develop short assessments for students enrolled in Introduction to Biology I. The quizzes were given to all the students enrolled in the class, with the goal of finding out whether these quizzes provide students with a self assessment method and act as a learning tool. By providing the students with a reflection opportunity (a brief questionnaire asking students to reflect on whether the quizzes were helpful including what they liked or did not like), I have been able to collect information regarding the effectiveness of these quizzes and whether they should be integrated into a distance education version of Introductory Biology.

Student Author(s): Alison Mortensen

Department(s): Biological Sciences

Teaching Mentor(s): Mary Beth Hawkins/Zoology

Title of Presentation: Improving Animal Anatomy and Physiology Laboratory Manual

The primary objective of this project was to revise the Animal Anatomy and Physiology Laboratory (ZO250L) manual. In Fall 2008, I participated in the teaching of ZO250L and used my weekly observations to determine possible areas of improvement and develop an in-class survey that was administered to all ZO250L sections (n=217) at the end of the semester. I used the results of this survey, along with my own observations and discussions with other lab instructors, to identify ways to improve the manual. The survey indicated that, despite a large majority of students agreeing or strongly agreeing with the two positive statements about the quality of the lab manual, many of these same students also offered negative comments in the open-ended questions. Nearly half (45%) of students did not agree that there was adequate resources to write their reports, however 92% did not make use of the on-line resource available. I feel this suggests the students would benefit from having more information about scientific writing integrated into the provided class material. Additionally, both teaching assistants and students suggested incorporating errata, such as study guides and figures, into the manual. Also both TAs and students identified the problem of long-term fetal pig storage for dissection labs. The current organization of the lab requires eleven weeks storage between dissections, and this has led to problems with decomposition and degradation of specimens. I addressed these problems in my revision of the manual and organization of the class by: providing more scientific writing resources and incorporating the errata within the manual itself, and consolidating the dissection labs into one section.

Student Author(s): Elizabeth A. Whalen

Department(s): Animal Science

Teaching Mentor(s): Myra Moses/Center for Excellence in Curricular Engagement

Title of Presentation: Students' Introduction to Service-Learning Classes and How They Choose to Continue Their Involvement in Service-Learning

Service-learning courses offered at NC State University are part of the "Every Student a Leader" initiative as outlined in the "UNC Tomorrow: NC State Response" by Chancellor Oblinger (2008). The introduction and retention of students in service-learning courses is one component of encouraging students to participate in interdisciplinary learning and problem-solving. Service-learning activities are designed to enhance students' involvement in the community as students become intentional in the application of their academic studies to community service. The Center for Excellence in Curricular Engagement has partnered with the University Honors Program to offer a one-credit hour service-learning class introducing NC State students to service-learning concepts and applications of critical reflection at a low intensity, in order to prepare students for more rigorous course-based service-learning projects. The spring 2009 service-learning course, HON 102D: Societal Responsibilities toward Animal Domestication, was designed to introduce students to service-learning concepts through the academic content of animal stewardship. Students were required to participate in three service-learning projects as a class and complete a fourth service-learning project independently. An exploratory survey using primarily Likert-type questions was designed to assess students' background experience with service-learning, satisfaction with HON 102D, and future decisions about applying service-learning concepts. A total of 13 undergraduate, University Honors students signed up for HON 102D; one student dropped the course at the beginning of the semester due to time constraints. The class on average showed agreement with the fact that HON 102D was representative of a non-traditional course, and was more inclined to agree that they would rather do community service with a class at NC State University than individually. The class also indicated they were neutral on the decision to register for another service-learning class; however, they would be more inclined to incorporate a service-learning project into an Honors contract with their classes.

Student Author(s): Jeanne M. Zimmerman

Department(s): Animal Science

Teaching Mentor(s): Paul D. Siciliano/Animal Science

Title of Presentation: Investigating Parasite Infestation in Weanling Aged Horses

Intestinal parasites cause a myriad of problems among multiple systems in a horse's body. While it is commonly known that intestinal parasites detract from the nutritional value absorbed from a horse's diet, there are many other issues caused by such parasites that can be just as or more detrimental to the animal's well being. In acting as a teacher's assistant for Dr. Paul Siciliano's class, ANS 411 Growing and Performance Horse Management, I helped students explore the importance of keeping horses on an up to date de-worming schedule by educating them about the many prevalent parasites, their affect on horses both anatomically and physiologically, and the multiple ways to de-worm while avoiding resistance to certain anthelmintics. The focus of this class was primarily nutritional and physiological aspects of the young and growing horse along with common management practices. Therefore, as my topic of scheduled de-worming fell under common management practices, I placed most of my focus on parasites affecting foal to weanling aged horses. By giving an in class lecture using power-point technology, the students were introduced to the above topics in great detail, and were tested on the information during their next in class test. I also instructed a hands on lab where students learned how to run a fecal examination by preparing slides using their own weanlings fecal matter, and looking at the slides under the microscope to determine the type of infestation and method of de-worming appropriate for their individual horse. This information and hands on experience was new to almost all of the students, as most individuals in the equine world are not exposed to the details behind de-worming. For most horse owners de-worming is strictly routine, and because of this there is unnecessary resistance stemming from overuse of anthelmintics on the market. The need for knowledge of how to reduce further resistance is extremely important to the lives of horses in America and abroad. By teaching the students my knowledge about the subject, this project was a success in revealing the importance of proper deworming and will hopefully inspire further interest and research in this area.